

**PROGRAM IMPLEMENTATION PLAN  
FOR THE  
DIGITAL VOICE RECORDING SYSTEM (DVRS)  
CIP # 62-11/C-02 - DVRS Initial Phase  
CIP # 62-11B/C-23 - DVRS Phase I  
CIP # 62-11C/C-23 - DVRS Phase II**



**DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION**

May 6, 1996

## **FOREWORD**

This letter transmits the Program Implementation Plan (PIP) which provides technical guidance and direction to all levels of the FAA that are responsible for the implementation of the Digital Voice Recorder (DVRs). It provides guidance and direction for the orderly implementation of the DVRs equipment. This PIP identifies project management, project implementation policy, and responsibilities affecting the activities of organizations. Specific events and activities described herein will be updated and refined, as more experience is gained on the project.

The Federal Acquisition Streamlining Act (FASA) of 1994, Section 5063 of the Act provides for the establishment of an FAA Acquisition Pilot Program. Under this Act the Secretary of Transportation is authorized to waive any provision of the Federal Acquisition Regulation (FAR) that is not required by statute, thus providing the FAA flexibility in procurement procedures for commercial-off-the-shelf (COTS) equipment and/or supplies. The DVRs project has been selected as a Acquisition Pilot Program within the Department of Transportation (DOT). As such, the procedures and responsibilities of this project were developed within the bounds of this Act.

The DVRs Project is divided into three distinct phases. The Initial Phase is under Capital Investment Plan (CIP) 62-11, providing for system acquisition and implementation for the first, approximately 100, sites. Phases I and II will be funded under a new CIP, as such an independent Mission Need Statement (MNS), MNS # 295, has been approved prior to funding for these two phases.

## **APPROVAL**

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**DOCUMENT CHANGE NOTICE**

1. Originator Name and Address AND-320 Washington, DC	2. [X ] Proposed	3. Code Identification	4. Standard No.		
7. System Designation NAS		5. Code Identification N/A	6. DCN No.		
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11. Program Implementation Plan for: Digital Voice Recorder System (DVRS )		12. Effectively N/A			
<p>This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with non-listed pages of the original issue of the revision shown in block 4, constitute the current version of this specification.</p>					
13. DCN No.	14. Pages changed		S*	A/D *	15. Date

	<p>This document is a complete revision of the DVRS PIP 6690.5, dated 10/31/95. Revised sections include, but are not limited to, equipment layout specifications, AOS recommendations for site readiness, and logistics support - to include system support and personnel training.</p> <p>This document supercedes the DVRS PIP, dated October 31, 1995.</p>			May 1, 1996
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S\* = Indicates Supersedes Earlier Pages    \*A = Indicates Added Page    \*D = Indicates Deleted Page

## TABLE OF CONTENTS

<b>1.0 GENERAL</b>	<b>1</b>
1.1 Purpose of Document	1
1.2 Scope of Document	1
1.3 Distribution	1
1.4 Definition of Terms	1
1.5 Cancellation	4
1.6 Authority to Change	4
1.7—1.19 Reserved	4
1.20 Risk Assessment Overview	4
<b>2.0 PROJECT OVERVIEW</b>	<b>5</b>
2.1 Synopsis of Mission Need	5
2.1.1 Operational Needs	5
2.1.2 Strategic Goals	6
2.2 Functional Description	6
2.3 Project History & Status	7
2.4 Project Milestones	7
2.5 Inter-Agency Involvement	8
2.5.1 Department of Defense (DoD)	8
2.5.2 National Weather Service (NWS)	8
2.5.3 US Customs Service - (N/A)	8
2.5.4 Drug Enforcement Agency (DEA) - (N/A)	8
2.5.5 Other Agencies	8
2.6-2.19 (Reserved)	8
2.20 Risk Assessment	8
<b>3.0 AF OPERATIONS</b>	<b>9</b>
3.1 Summary of Maintenance Operations Impacts	9
3.1.1 Transitory State	9
3.1.2 Operational State	9
3.2 AF Procedural Changes	9
3.2.1 Preventive Maintenance	9
3.2.2 Corrective Maintenance	10
3.2.3 Software Maintenance	10

3.2.4 System Operations/Monitoring	10
3.2.5 System Certification	10
3.2.6 Personnel Certification	11
<b>3.3 Facilities and Equipment</b>	<b>11</b>
<b>3.4 Systems Maintenance</b>	<b>11</b>
<b>3.5-3.19 (Reserved)</b>	<b>12</b>
<b>3.20 Status Assessment</b>	<b>12</b>
<b>4.0 AT OPERATIONS</b>	<b>13</b>
<b>4.1 Summary of AT Operational Impacts</b>	<b>13</b>
4.1.1 Transitory State	13
4.1.2 Operational State	13
<b>4.2. AT Procedural Changes</b>	<b>13</b>
4.2.1 ATC Operational and Management Procedures	13
4.2.2 Flight Procedures/Standards	13
4.2.3 Administrative and Management Procedures	13
4.2.4 Software Verification Procedures	13
4.2.5 Inter-facility Procedures	13
4.2.6 Personnel Certification Procedures	13
4.2.7 System Backup/Cutover Procedures	14
<b>4.3 AT Implementation</b>	<b>14</b>
<b>4.4-4.19 (Reserved)</b>	<b>14</b>
<b>4.20 Status Assessment</b>	<b>14</b>
<b>5.0 SYSTEM CONFIGURATION AND ENGINEERING</b>	<b>15</b>
<b>5.1 NAS Level Architecture</b>	<b>15</b>
5.1.1 NAS Target State	15
5.1.2 Inter-program interfaces	15
<b>5.2 Platform Architecture</b>	<b>15</b>
5.2.1 Interim Platform Configuration	15
5.2.2 Target State Configuration	15
<b>5.3 Subsystem Level Architecture</b>	<b>16</b>
5.3.1 Hardware	16
5.3.2 Software	18
5.3.3 Physical Specification	18
<b>5.4-5.19 (Reserved)</b>	<b>22</b>
<b>5.20 Status Assessment</b>	<b>22</b>
<b>6.0 PHYSICAL FACILITIES</b>	<b>23</b>

<b>6.1 Real Estate</b>	<b>23</b>
6.1.1 Real Estate Requirements - N/A	23
6.1.2 Real Estate Plans - N/A	23
<b>6.2 Heating, Ventilation &amp; Air Conditioning (HVAC)</b>	<b>23</b>
6.2.1 HVAC Requirements	23
6.2.2 HVAC Plans - N/A	23
<b>6.3 Cables</b>	<b>23</b>
6.3.2 Cable Plans	23
<b>6.4 Power</b>	<b>23</b>
6.4.1 Power Requirements	24
6.4.2 Power Plans	24
<b>6.5 Physical Safety &amp; Security</b>	<b>24</b>
6.5.1 Security and Safety Requirements	24
6.5.2 Security and Safety Plans and Procedures	24
<b>6.6 Environmental / HAZMAT</b>	<b>24</b>
6.6.1 Environmental Monitoring/ HAZMAT Requirements	24
6.6.2 Environmental Plans and Procedures	25
<b>6.7 Grounding, Bonding, Shielding &amp; Lightning Protection</b>	<b>25</b>
6.7.1 Grounding, Bonding, Shielding & Lightning Protection Requirements	25
6.7.2 Grounding, Bonding, Shielding & Lightning Protection Plans - N/A	25
<b>6.8 Space</b>	<b>25</b>
6.8.1 Space Requirements	25
6.8.2 Space Allocation Plans	25
<b>6.9 Construction &amp; Modification</b>	<b>26</b>
6.9.1 Construction and Modification Requirements	26
6.9.2 Construction and Modification	26
<b>6.10 Telecommunications</b>	<b>26</b>
6.10.1 Telecommunications Requirements	26
6.10.2 Telecommunications Plans and Procedures - N/A	26
<b>6.11-6.19 (Reserved)</b>	<b>26</b>
<b>6.20 Status Assessment</b>	<b>26</b>
<b>7.0 FINANCIAL RESOURCES</b>	<b>27</b>
<b>7.1 Summary of Funding Plan</b>	<b>27</b>
<b>7.2 Facilities and Equipment (F&amp;E) Budget</b>	<b>28</b>
7.2.1 F&E Budget Requirements	28
7.2.2 Summary of F&E Funding Status	28
<b>7.3 Operations and Maintenance (O&amp;M) Budget</b>	<b>28</b>
7.3.1 O&M Budget Requirements	28
7.3.2 Summary of O&M Funding Status	28

<b>7.4 Research, Engineering and Development (RE&amp;D) Budget</b>	<b>28</b>
7.4.1 RE&D Budget Requirements (N/A)	28
7.4.2 Summary of RE&D funding Status (N/A)	28
<b>7.5-7.19 (Reserved)</b>	<b>26</b>
<b>7.20 Status Assessment</b>	<b>28</b>
<b>8.0 HUMAN RESOURCES</b>	<b>29</b>
<b>8.1 Human Resource Management</b>	<b>29</b>
8.1.1 Impacts of Acquisition on Human Resource Management	29
8.1.2 Human Resource Implementation Strategies	30
8.1.3 Security Clearances	30
<b>8.2 Staffing</b>	<b>30</b>
8.2.1 Impacts of Acquisition on Staffing	30
8.2.2 Staffing Plans	32
8.2.3 Staffing Schedule - N/A	32
<b>8.3 Training</b>	<b>32</b>
8.3.1 Training Program	32
8.3.2 Training Support	33
8.3.3 Personnel Skills	33
8.3.4 Training Quotas	33
8.3.5 Training Schedule	33
<b>8.4-8.19 (Reserved)</b>	<b>33</b>
<b>8.20 Status Assessment</b>	<b>34</b>
<b>9.0 TEST EVALUATION</b>	<b>35</b>
<b>9.1 Overview of Test Activities</b>	<b>35</b>
9.1.1 Government Test Activities	35
9.1.2 Contractor Test Activities	35
<b>9.2 T&amp;E Schedule</b>	<b>35</b>
<b>9.3 T&amp;E Responsibility Matrix</b>	<b>36</b>
9.3.1 Government Test Organization	36
9.3.2 Contractor Test Organization	36
<b>9.4 T&amp;E Field Support Requirements</b>	<b>36</b>
9.4.1 Personnel Requirements	36
9.4.2 Test Equipment Requirements	36
9.4.3 System Access	36
9.4.4 Space Requirements	36
<b>9.5 T&amp;E Activities Status</b>	<b>37</b>
9.5.1 Test Results Summary	37
9.5.2 Outstanding Program Trouble Reports (PTR)	37
9.5.3 Discrepancy Correction Process	37



<b>9.6-9.19 (Reserved)</b>	<b>37</b>
<b>9.20 Status Assessment</b>	<b>37</b>
<b>10.0 SYSTEM SUPPORT</b>	<b>39</b>
<b>10.1 System Support Concept</b>	<b>39</b>
10.1.1 Hardware	39
10.1.2 Software	39
<b>10.2 Special Support Facilities</b>	<b>39</b>
10.2.1 Mike Monroney Aeronautical Center	37
10.2.2 FAA Technical Center	41
10.2.3 Other Special Support Facilities	42
<b>10.3 Materiel Support</b>	<b>42</b>
10.3.1 Project Materiel	42
10.3.2 Provisions and Supply Support	43
10.3.3 Packaging Transportation and Storage	43
<b>10.4 Technical Documentation</b>	<b>43</b>
10.4.1 Hardware Documentation	43
10.4.2 Software Documentation	43
10.4.3 Procedural Documentation	43
<b>10.5 Site Procured Implementation Items/Tools</b>	<b>44</b>
10.5.1 Site Procured Implementation Items/Cables	44
10.5.2 Implementation Maintenance Items/Tools	45
10.5.3 Audio Bus Items/Parts	46
<b>10.6-19 (Reserved)</b>	<b>47</b>
<b>10.20 Status Assessment</b>	<b>47</b>
<b>11.0 PROJECT SCHEDULE INFORMATION</b>	<b>49</b>
<b>11.1 NAS Implementation Schedule</b>	<b>49</b>
11.1.1 Deliveries and Installation	49
<b>11.2 Deployment Schedule</b>	<b>49</b>
<b>11.3 Site Implementation Schedule</b>	<b>49</b>
<b>11.4 Schedule Dependencies</b>	<b>50</b>
<b>11.5-11.19 (Reserved)</b>	<b>51</b>
<b>11.20 Status Assessment</b>	<b>49</b>
<b>12.0 ADMINISTRATION</b>	<b>53</b>
<b>12.1 Acquisition Summary</b>	<b>53</b>
12.1.1 Market Survey	53

12.1.2 Acquisition Strategy	53
<b>12.2 Contracting Information</b>	<b>53</b>
12.2.1 Prime Contract	53
12.2.2 Service Contract	54
12.2.3 Project Support Contracts	54
12.2.4 Regional Contracting	54
12.2.5 GFP/GFI/GFE Obligations	54
<b>12.3 Project Management (PM)</b>	<b>54</b>
12.3.1 Project Charter	54
12.3.2 Integrated Project Team (IPT)	54
12.3.3 Project Status Report	55
12.3.4 Exception Management	55
<b>12.4 Quality Assurance</b>	<b>56</b>
12.4.1 Project Acceptance Criteria	56
12.4.2 Risk Management	56
<b>12.5 Configuration Management (CM)</b>	<b>57</b>
12.5.1 CM Responsibilities	57
12.5.2 Configuration Control Boards (CCB)	57
12.5.3 CM Milestones	57
12.5.4 Configuration Items	58
<b>12.6-12.19 (Reserved)</b>	<b>58</b>
<b>12.20 Status assessment</b>	<b>58</b>
<b>13.0 IMPLEMENTATION (REQUIREMENTS)</b>	<b>59</b>
<b>13.1 Implementation Support Organization</b>	<b>59</b>
13.1.1 NAS Implementation Specialist	59
13.1.2 Implementation Management Team (IMT)	59
13.1.3 Regional Associate Program Manager (RAPM)	59
13.1.4 Technical Officer Representatives (TOR)	60
13.1.5 Contract Support	60
<b>13.2 Site Implementation Process</b>	<b>61</b>
13.2.1 Implementation Planning Phase	61
<b>13.2.2 Pre-Installation and Checkout (Pre-INCO) Phase</b>	<b>62</b>
13.2.3 Installation and Checkout (INCO) Phase	63
13.2.4 System Integration Phase	63
13.2.5 Field Shakedown Phase	65
13.2.6 Dual Operations Phase	65
13.2.7 Equipment Removal Phase	65
<b>13.3-13.19 (Reserved)</b>	<b>66</b>
<b>13.20 Status Assessment</b>	<b>66</b>

<b>APPENDIX A GENERIC SITE IMPLEMENTATION PLAN (GSIP)</b>	<b>A-1</b>
<b>APPENDIX B TRANSITION INFORMATION EXCHANGE (TIE) SUMMARY RPT</b>	<b>B-1</b>
<b>APPENDIX C ACRONYMS</b>	<b>C-1</b>
<b>APPENDIX D SITE DEPLOYMENT SCHEDULE</b>	<b>D-1</b>
<b>APPENDIX E ATTACHMENTS</b>	<b>E-1</b>

## FIGURES AND TABLES

### FIGURES

FIGURE 5-1	DVRS Recorder	19
FIGURE 5-2	DVRS Reproducer	19

### TABLES

TABLE 2-1	DVRS Schedule, for Project Milestones	8
TABLE 10-1	Spares for Selected Locations	40
TABLE 10-2	Test Cables	43
TABLE 10-3	Maintenance Tools	43
TABLE 10-4	Audio Bus Parts	44
TABLE 10-5	LAN Interconnection Parts	44
TABLE 10-6	Accessories	45
TABLE 11-1	Site Implementation Activity Estimates	48
TABLE 12-1	IPT Members	53
TABLE 13-1	Regional Associate Program Managers	58

## **1.0 GENERAL**

### **1.1 Purpose of Document**

This Program Implementation Plan (PIP) provides management and technical guidance for the implementation of the Digital Voice Recording System (DVRS), and is to be used for all DVRS technical and resource planning activities.

### **1.2 Scope of Document**

The PIP is applicable to all levels of FAA that are responsible for implementing the DVRS Project. It is an iterative document and will be updated during subsequent phases of the acquisition. Consequently, information required for specific sections may not be available at the time a particular version is issued. These sections are annotated with the acronym "TBS" to be supplied. The contents of this PIP are organized by the eleven essential elements of information as defined in FAA Order 1810.1F and documents the strategy, requirements activities, and responsibilities necessary to support deployment and operation of DVRS in the field. This PIP also has five attachments, Appendix A, The Generic Site Implementation (GSIP), Appendix B, The Transition Implementation Exchange (TIE) Summary Report, Appendix C, Acronyms, Appendix D, DVRS Site Deployment Schedule, and Appendix E, Memorandums and Letters. The GSIP is a generic site configuration task list using technical information from the PIP and defines activities to be accomplished during each of the seven phases of implementation described in Chapter 13. The TIE Summary Report lists transition and implementation issues and summarizes the action plans and resolution of each.

### **1.3 Distribution**

This plan should be distributed to the team level of the Air Traffic Service, Airway Facilities Service, Office of Independent Operational Test & Evaluation, Office of Acquisitions, Office of Air Traffic Systems Development, Office of Communications, Navigation & Surveillance Systems, Office of System Architecture & Program Evaluation, and Office of Human Resource Management. This plan should be distributed to the branch levels of the FAA Technical Center; the regional Air Traffic, Airway Facilities, and Logistics Divisions; and the Mike Monroney Aeronautical Center's Office of Facility Management and FAA Logistics Center. Also this plan should be distributed to Air Traffic and Airway Facilities field sites.

### **1.4 Definition of Terms**

The following terms are defined to clarify their specific usage in this document:

NAS Implementation Specialist: The member of the Integrated Product Team assigned by NAS Transition and Implementation Service (ANS) to plan and coordinate program implementation, and to serve as an information bridge between Headquarters, Region, and field activities.

Essential Elements of Information: The eleven essential elements of information that are critical and are required to be addressed in the PIP are: AF Operations, AT Operations, System Configuration & Engineering, Physical Facilities, Financial Resources, Human Resources, Test & Evaluation, Implementation, System Support, Schedule, and Administration.

Implementation: Those activities necessary to deploy and support the products of a single program into a facility or field environment. Implementation activities include program planning for implementation during early acquisition phases and extend through site and facility preparation for new or relocated systems and equipment, equipment installation and test, completion of all steps leading to full operational capability and facility commissioning. Implementation also includes the removal of replaced equipment and the refurbishment of associated space and real property. Implementation activities during the system/equipment acquisition have been divided into phases bounded by specific acquisition milestones. The phases are:

Implementation Planning: Spanning the time prior to equipment installation and extending into the integration and testing of new systems, there are ongoing program implementation planning activities.

Pre-Installation and Checkout (Pre-INCO): The PRE-INCO phase begins with the conduct of the program site survey and concludes with delivery of project equipment at the site. During the interval between these two milestones, all site preparation tasks necessary for installation of equipment are performed.

Installation and Checkout (INCO): The INCO phase begins with delivery of project equipment at the site and continues through successful completion of testing of the equipment in stand-alone mode. No FAA interfaces are integrated during this phase. The equipment contractor is normally responsible for installation activities and FAA personnel are in a monitor role. The INCO phase entails all the activities associated with receipt and positioning of program equipments, positioning and testing of stand-alone functionality. The milestone demarking the end of this phase normally conclusion of the Contractor Acceptance Inspection (CAI).

System Integration: The System Integration phase begins when CAI is accomplished and concludes when the FAA declares Initial Operational Capability (IOC) for the system. During this phase, all FAA internal and external interfaces are established. The fully integrated functioning of program equipments and systems is verified and operational responsibility for the system is transferred from the contractor to the FAA.

System Shakedown: The System Shakedown phase extends from the IOC milestone through completion of the Operational Readiness Demonstration. During this interval, the technical and operational work forces and management personnel employ the new equipment in a carefully controlled operational environment to verify that the fully integrated system is fully functional. Use of the new system capabilities typically begins with use for limited periods of time during low traffic time periods, gradually increasing usage for longer periods under full traffic load conditions. During this time, site personnel develop full proficiency in the maintenance and operation of the newly configured operational system. During this time, the contractor is in a support role.

Dual Operations: The Dual Operations phase follows completion of the ORD milestone through commissioning of the system for on-going operations through completion of the Joint Acceptance Inspection (JAI). During this interval the system is commissioned and pre-determined minimum number of personnel are certified on use of the system. The replaced system is available in back-up mode. The Dual Operations phase will not be applicable to all acquisition projects.

Equipment Removal: The Equipment Removal phase follows completion of the JAI milestone and extends until all replaced equipment, implementation support and test equipment is removed and the facility is refurbished or restored. Included during this phase are all activities necessary to resolve outstanding project trouble reports (PTAs), outstanding Deployment Readiness Review (DRR) checklist items and JAI items. At the completion of this phase, implementation activities identified in the Site Implementation Plan (SIP) requirements will be accomplished.

Implementation Management Team (IMT): A team established by the NAS Implementation Specialist and the Integrated Product Team Lead. The IMT consists of the NAS Implementation Specialist, representative regional implementation personnel and other Associate Program Managers.

Management by Exception: A management concept in which an issue is only elevated after every effort has been made to resolve the concern within the manager's authority and resources.

Milestone: A significant event that marks the successful completion of a series of dependent activities resulting in definable program progress.

Operational State: The portion of the system/equipment life-cycle following the successful completion of site implementation.

Operations & Maintenance: The Operations & Maintenance phase of the acquisition process begins upon completion of the JAI and continues beyond implementation for the remainder of the system life cycle. The Operations & Maintenance phase marks the achievement of full operational capability.

Personnel Certification: Personnel certification is a two-phase process consisting of a certification authority phase and a responsibility assignment phase. Certification authority requires FAA technical personnel to demonstrate knowledge of the theory of operations and the ability to practically demonstrate this knowledge. Certification responsibility is the official assignment to FAA technical personnel to use their authority to certify a specific service, system, subsystem, or equipment in the NAS.

Platform: A basic type of NAS facility that hosts the systems and subsystems necessary to perform an essential air traffic control function. The three types of platforms as currently defined are: Air Route Traffic Control Center (ARTCC), Metroplex Control Facility (MCF); Air Traffic Control Tower (ATCT)/Terminal RADAR Approach Control (TRACON); and Airway Support Facilities (ASF), Automatic Flight Service Station (AFSS).

Program / Project: A directed and funded effort that is designed to provide a new or improved capability in response to a validated need.

System Certification: Periodic verification and validation that the advertised quality and scope of services, and the capability of providing those services, are being provided to the users.

Risk: A subjective assessment made regarding the likelihood of achieving an objective within a specified time and with the resources provided.

Transition: The aggregate of implementation activities of multiple projects destined for deployment to a region, facility, or platform environment.

Transition/Implementation Information Exchange (TIE): A procedure conducted by the NAS Implementation Specialist and IMT to identify and resolve program implementation and transition issues. At least one TIE cycle is completed with each revision of the PIP. A TIE cycle begins with development of the PIP and ends when all issues have been addressed.

## **1.5 Cancellation**

No documents are canceled or superseded by this PIP.

## **1.6 Authority to Change**

Authority to change this PIP rests with the Product Team Lead for Voice Switching and Recording, AND-320, and the Manager, NAS Division, ANS-700. Authorized changes, updates, and revisions to this document will be made by the cognizant NAS Implementation Specialist.

## **1.7—1.19 Reserved**

## **1.20 Risk Assessment Overview**

Project issues and risks, and site implementation impacts addressed in the Status Assessment sections of this Project Implementation Plan are derived from the most complete and accurate data available at the time of printing. Any updated information will be supplied as available with a revision to this document. Status Assessment will also address the plans or potential solutions proposed to mitigate the identified problems.

The DVRS risk management process will involve the identification, analysis, evaluation, mitigation, and monitoring of risks associated with the implementation of the DVRS project. Risks can be identified through any source providing insight into the Project. Once a risk has been identified, documented, and reported to management, a risk analysis will be conducted by the cognizant IPT member under the direction of the IPT Lead, or his or her appointee. A mitigation plan will be prepared, and forwarded to the IPT Lead for evaluation and approval. Once a risk mitigation plan has been established, a continuing evaluation effort is important to assure that:

- The expected results are obtained.
- Factors attendant to the risk have not changed.
- No new risks have been introduced.



## **2.0 PROJECT OVERVIEW**

### **2.1 Synopsis of Mission Need**

One of the many responsibilities of the FAA, in support of the National Airspace System (NAS), is to provide voice recording capability between air traffic controllers, pilots, and ground based air traffic facilities. The FAA initiated the DVRS procurement to keep pace with rapid advances in digital voice recording technology, to offer additional functional and operational capabilities, and improve performance and reliability. The DVRS is an integrated, digital voice recording system that will fulfill voice recording requirements for all FAA facilities. [Source: DVRS Mission Need Statement 5/16/95]

#### **2.1.1 Operational Needs**

The operational needs of the DVRS include, but are not limited to:

- Provide recording of all voice communications involving air traffic control activities.
- Record, reproduce, duplicate, and erase after 15 days storage, the recorded voice communications data.
- Record a time code that is synchronized with an external time source or with an internal coded time source (CTS).
- Trigger record, on a selectable basis, continuous voice input, voice activated input, contact closure, A/G squelch break, and Push-to-talk (PTT).
- Recorder and Reproducer systems to provide sensors for media end, media failure, or media remaining.
- Recorder and Reproduce systems to provide an automatic shutdown in the event of power failure, media failure, or end of media detection.
- Recorder system initiate automatic switchover to standby recorder (independent DAT drive/tape transport) on media end sensing, media failure sensing, failure of media remaining sensor, any condition actuating shutdown, or failure of record function in the operating recorder.
- Recorder system alarm generation on switchover from operating to standby recorder (with the exception of designated sensing for switching), failure of power supply, loss of time code, or record malfunction.
- Monitor recording.
- Reproduction system to provide playback of a single channel or two simultaneous channels.
- Duplication system to provide recording and reproduction of at least two selected channels.
- Erasure of media.
- Provide time code source, i.e., time of day information synchronized to universal coordinated time (UTC).
- Interface with voice switching communication equipment.
- Provide automatic continuous self test operations.
- Provide remote alarm indicating failure.

[DVRS Mission Need Statement, 5/16/95]

The DVRS will ultimately be installed in approximately 536 sites establishing a DVRS as the voice recorder baseline system by year 2002. The DVRS will be a commercial off-the-shelf (COTS) system

and will support all FAA voice recording requirements. The DVRS will integrate digital recording technology to improve the reliability, flexibility, and reduce current media storage requirements. [DVRS Operational Requirements Document, 3/14/95]

### **2.1.2 Strategic Goals**

The DVRS project will be a comprehensive recorder replacement project, providing reliable digital recording capability in facilities with aging (1970's and earlier) analog recorders. The DVRS equipment will be procured in three phases, Initial, Phase I, and Phase II. The following narrative associates the type(s) of facilities with their respective phase:

- (1) Initial Phase: Replacement of recorders in radar facilities not consolidated under the Area Control Facility (ACF) concept. Facility size, in terms of number of channels of recording vary between 5 and 60 channels. Approximately 100 facilities are under consideration within this category.
- (2) Phase I: Replacement of multi-channel analog recorders currently installed in low to mid sized terminals), remaining non-consolidated radar facilities, air traffic control tower (ATCT), automated flight service stations (AFSS), and flight service stations (FSS). Approximately 430 low to mid sized facilities are within this category.
- (3) Phase II: Replacement of the HCVR, sixty channel recorders.
- (4) This three phased approach to the installation of the DVRS will be managed by AND-320 and coordinated with the ATR and the Regions. Adjustments may be made to this phased deployment plan in order to meet any unforeseeable requirements necessitating such a response.

## **2.2 Functional Description**

The follow items listed here are those functional baseline requirements in the DVRS Statement of Work.

- 1) The DVRS consists of Commercial-Off-The-Shelf (COTS) hardware, firmware and software.
- 2) The DVRS provides the capability to record, reproduce and duplicate where appropriate, and erase the legal voice communications involving air traffic control operations. The DVRS Recorder consist of Digital Recorder Unit(s) (DRU) - sized to meet the facilities recording/channel requirements, PC based control interface workstation/maintenance interface, Ethernet Hub, and External Alarm Indicator, Gobal Positioning System receiver (GPS), Equipment Enclosure/Rack, Technical Documentation and an initial media stock of twenty (20) Digital Audio Tapes (DATs). The DVRS Reproduser consist of the Reproduser (the recorder element), Control Interface/Workstation, Dual Cassette Player/Recorder, Time Code Display, Ethernet Hub (Optional), and Technical Documentation.
- 3) The DRU as specified in the DVRS Statement of Work (SOW) paragraph C.3.1.2.2 has the capability to function as a stand-alone unit.
- 4) The Reproduser as specified in the DVRS Statement of Work (SOW) paragraph C.3.1.2.3 has the capability to function as a stand-alone unit.

- 5) A Two-Channel Cassette/Recorder will record IRIG-B time code, as specified in the DVRS Statement of Work (SOW) paragraph C.3.1.5.2 on the left channel and selected voice recording(s) on the right channel.
- 6) Media stock will be supplied with each DRU. This media stock will total, at a minimum, 20 Digital Audio Tapes (DATs), there is a plan to provide an additional 20 DATs.
- 7) The DVRS includes an equipment enclosure as identified in the DVRS Statement of Work (SOW) paragraph C.3.1.6.4.4.
- 8) The DRU(s) and ancillary equipment, are mounted in an equipment enclosure. [Source: DVRS SOW, dtd, 5/26/95]

### **2.3 Project History & Status**

In May 1994 a Purchase Description/Statement of Work (PD/SOW) document was developed for DVRS and released for industry review as part of a market survey. Upon completion of the market survey the PD/SOW document was revised to reflect industry comments. An initial Cost/Benefit Analysis was completed April 15, 1994. The DVRS Operational Requirements Document (ORD) was developed in July 1994. A Procurement Readiness Review (PRR) was conducted on September 30, 1994. The DVRS Project, Initial Phase, was selected as the DOT pilot program to streamline the acquisition process in November 1994, and the DVRS Qualification Package was released on January 13, 1995. For the Initial Phase of this project the CIP 62-11 MNS is appropriate, for Phases I and II CIP 6211B/C-23 and 6211C/C-23 respectively are appropriate.

### **2.4 Project Milestones**

See table 2-1, DVRS Schedule, for project milestones. The DVRS NAS Implementation Schedule is provided in Appendix D. Site Implementation activities are provided in section 13.2.3. The first operational site deployment is scheduled for Fall 1995; all Shakedown activities not completed prior to this deployment will be concluded on site.

1.	PRR	Sep-94
2.	Release Qualification Package	Jan-95
3.	Complete Technical Evaluation	Jun-95
4.	Initial ILSP Approval Date	Aug-95
5.	Award Contract	Aug-95
6.	Logistics/Training Guidance Conference	Aug-95
7.	Deployment Readiness Review EXCOM Decision	Jan-95
8.	First System Delivery	Jan-96
9.	Airway Facilities (AF) Training Start	Jan-96
10.	Air Traffic (AT) Training Start	Jan-96
11.	Last System Delivery Date	FY2002

Table 2-1, DVRS Schedule, for Project Milestones

## 2.5 Inter-Agency Involvement

### 2.5.1 Department of Defense (DoD)

The United States Army has provided funding for the acquisition of DVRS s by the DOT, additionally, there is expressed interest by both the US Air Force and Navy in this acquisition.

### 2.5.2 National Weather Service (NWS)

No requirements or interfaces with this agency exist or are expected.

### 2.5.3 US Customs Service - (N/A)

### 2.5.4 Drug Enforcement Agency (DEA) - (N/A)

### 2.5.5 Other Agencies

Interfaces with other agencies do not exist or are expected.

## 2.6-2.19 (Reserved)

## 2.20 Risk Assessment

A market survey of available equipment was used to develop the draft requirements document. The selected vendor's DVRS equipment has met or exceeded all documented requirements.

### **3.0 AF OPERATIONS**

#### **3.1 Summary of Maintenance Operations Impacts**

##### **3.1.1 Transitory State**

Facilities and Equipment (F&E) and System Management Office (SMO) personnel, may participate in all phases of site implementation activities of the DVRS. F&E personnel may provide and manage electronics engineering resources and may oversee all site installation activities. Section 3.3, Facilities and Equipment (below), provides more detail on F&E site implementation activities.

The DVRS installer will wire the system to an demarcation point, i.e., 66 block, installed within the DVRS equipment rack(s). Upon completion of Contractor Acceptance Inspection integration of the DVRS with the facilities voice switch will require the facilities' personnel to cross connect the current voice recorder demarc and/or patch panel to the 66 block/demarcation within the DVRS equipment rack(s). The DVRS will run in parallel with the facilities current recording system until the facility is comfortable with the operational and maintenance functions, or time expires for the requirement to have the replaced recording systems available for playback of reel to reel recordings. SMO personnel will be responsible for conducting the subsequent Joint Acceptance Inspection (JAI), updating personnel and equipment certification requirements to reflect the DVRS. Section 3.4, Systems Maintenance (below), provides more detail on SMO site implementation activities.

##### **3.1.2 Operational State**

Once the DVRS is in operation the activities associated with tape replacement, i.e., handling, storage, periodicity of change-out, and the reproduction of tapes will differ from those currently in use on analog recorder. These operations will be described in detail in the operations handbook. The maintenance support concept for the DVRS is guided by FAA Order 6000.30B, Policy for Maintenance of the NAS Through the Year 2000. System field maintenance will be provided by FAA technicians once the DVRS has been accepted at the JAI. At the completion of the CAI the contractor will repair or replace all hardware, software and firmware received from the Government which fails or become defective for a period of three years. Beyond this period, based on support considerations, additional contractor maintenance support may be procured. Second level engineering support/technical assistance will be managed by AOS-200. [Source: DVR Maintenance Requirement Document (MRD), Draft, July 13, 1994, p.2]

#### **3.2 AF Procedural Changes**

##### **3.2.1 Preventive Maintenance**

Preventive field maintenance will be performed in accordance with performance checks specified in a new FAA Order XXXX.X, Maintenance of Digital Voice Recorder Equipment. This new order is being developed by AOS-260 to address digital recording.

NOTE: AOS-260 has issued a notice, N6670.11 which outlines interim certification, standards and tolerances, and operational configuration parameters for DVRS [Source: DVRS ILSP, dtd 1/24/96]

### 3.2.2 Corrective Maintenance

Corrective maintenance service will commence promptly after notification of failure(s) has occurred, or when, through the process of performing periodic maintenance services, it is determined that failure is imminent. When the faulty LRU is located, it will be removed from the equipment/subsystem and replaced with a serviceable spare. The Digital Recording Unit (DRU) mean-time-between-failure (MTBF) should be greater than or equal to 5000 hours for a DRU configured with its maximum channel capacity. [Source: DVRS DRAFT SOW, 5/26/95]

#### 3.2.2.1 Availability

The DRU inherent availability should be greater than or equal to 0.9999. [Source: DVRS DRAFT SOW, 5/26/95]

#### 3.2.2.2 Mean-Time-to-Repair

- a) The DVRS Mean-Time-to-Repair (MTTR) should be less than or equal to 30 minutes for any single corrective maintenance action, including the time required for fault isolation, removal and replacement of the failed Line Replaceable Unit (LRU), test, and restoral to service, excluding administrative and logistics delay time.
- b) Special test tools and test equipment should not be required to fault isolate or to perform removal and replacement of failed LRUs. [Source: DVRS DRAFT SOW, 5/26/95]

### 3.2.3 Software Maintenance

Due to the COTS nature of the DVRS software maintenance is expected to be at the LRU level, i.e., reload of COTS software on hard drive, or control/logic board(s).

### 3.2.4 System Operations/Monitoring

The vendor will deliver for Government review an approval an operations and maintenance manual to support the installation, operation, and maintenance of all hardware and firmware provided under this contract. This document will be delivered to the site/facility with the DVRS equipment. [Source: DVRS SOW / CDRL-E09]

### 3.2.5 System Certification

System certification will be accomplished, as required, locally. The essence of technical certification is the periodic verification and validation that the baseline quality and scope of services, and the capability of providing those services, are actually being provided to the users. DVRS maintenance technical handbooks will specify proper procedures to follow and frequency for establishing DVRS certification. [Source: FAA Order 6000.15B, General Maintenance Handbook for Airway Facilities, July 15 1991]

### 3.2.6 Personnel Certification

Personnel certification will be a two-phase process consisting of a certification authority phase and a responsibility assignment phase. Certification authority requires FAA technical personnel to demonstrate knowledge of the theory of operations and the ability to practically demonstrate this knowledge. Certification responsibility is the official assignment to FAA technical personnel to use their authority to certify a specific service/system/subsystem/equipment in the NAS. [Source: FAA Order 3400.3F, AF Maintenance Personnel Certification Program, August 6, 1992, p.13]

### 3.3 Facilities and Equipment

Airway Facility Facilities and Equipment (AF F&E) personnel may provide regional support to implementation activities, the main focus of their efforts being site preparation. During the pre-Installation and Checkout phases of implementation, AF F&E personnel may provide electronics engineering resources to aid the DVRS contractor during system installation. During the installation the DVRS contractor will provide all necessary tools, jigs, etc.

### 3.4 Systems Maintenance

Due to the Commercial off-the-shelf (COTS) nature of the DVRS and the ancillary equipment, and application software systems, maintenance will be limited to system monitoring, and LRU replacement by site technicians. System performance will be monitored via control panels and the remote alarm indicators. FAA system specialist will acquire sufficient knowledge of system operation to allow real-time analytical decisions regarding maintenance actions. Maintenance of the DVRS equipment will be accomplished at two levels: 1). site and 2). depot. Site maintenance will consist of routine preventive maintenance, isolation of failed line replaceable units (LRUs), replacement of appropriate units, and restoring the system to operational status.

Selected field maintenance personnel will be attending contractor provided operations and maintenance instruction during the installation of the DVRS at each site.

Configuration data will be made available to site technicians. This configuration data will include all software and hardware switch settings. In addition, instructions on all switch settings (soft and hard) will be included in technical instruction manuals. These instructions will include a functional description of each switch and instructions on how to change the settings. In case of software switches all information required to change the setting (keywords, etc.) will be provided. FAA approved default settings, once established, will be included within the DVRS handbook and/or O&M manual(s).

The DVRS will be under a warranty for a minimum of three (3) years after installation, requiring FAA field personnel to replace failed LRUs and ship the failed unit back to the vendor

System diagnosis will include a boot-up system test and identification of fault(s) to the LRU.

System failure alarms which could result in incoming voice signals not being recorded will be reported visually and audibly at the DRU. [Source: DVRS SOW, 5/26/95]

**3.5-3.19 (Reserved)**

**3.20 Status Assessment**

The DVRS Shakedown and OT&E evaluations/reports did not revealed any system requirements that have not been met or exceeded by the DVRS.



## **4.0 AT OPERATIONS**

### **4.1 Summary of AT Operational Impacts**

#### **4.1.1 Transitory State**

The installation of the DVRS will be accomplished by the installation contractor; the location of the DVRS and ancillary equipment will be determined by the region/site cognizant personnel. The replacement of analog recorder equipment is not expected to interrupt any recording functions. A dual operations period may be conducted after on-site system checkout, integration and test, the duration of dual operations will be at the discretion of the region/site AT and AF personnel. The requirement for the play back of analog "incident" type original tapes will be met with reproducer(s) located at AHT-10, Washington, DC.

#### **4.1.2 Operational State**

The nature of any changes with respect to AT operations is minimized to those locations where AT operations cross over to include some operations of the DVRS. In those cases tape change-out, handling, and storage require less time to complete and are inherently less complicated.

### **4.2. AT Procedural Changes**

#### **4.2.1 ATC Operational and Management Procedures**

The nominal system recording functions will be transparent to ATC, however, the operator requirements for system operations, i.e., for tape play-back, duping, etc., are described within the system O&M manual(s), and are addressed in the on-site training course provided with each DVRS.

#### **4.2.2 Flight Procedures/Standards**

The DVRS will not impact flight procedures/standards.

#### **4.2.3 Administrative and Management Procedures**

#### **4.2.4 Software Verification Procedures**

Software verification by AT personnel is not applicable to the DVRS. System default parameters will be established by AOS-260.

#### **4.2.5 Inter-facility Procedures**

No impact to interfacility procedures is anticipated as a result of the implementation of the DVRS.

#### **4.2.6 Personnel Certification Procedures**

Personnel Certification re: maintenance and operations will be given at the completion of completion of the DVRS training course provided by an accredited personnel.

#### 4.2.7 System Backup/Cutover Procedures

System operations procedures will be discussed in detail in the training sessions provided at system installation. Cutover procedures do not apply in the normal sense, in that the DVRS installation team will install and test the system in an operational configuration. Any dual operations required can be accomplished without interference to the DVRS. A more detailed description will be available in the DVRS Installation Plan.

### 4.3 AT Implementation

The implementation of DVRS, from the AT perspective will involve familiarization with DVRS system operations. AT training will be initially available at system delivery, dependent upon availability of training slots, after which AF trained technicians will provide training to AT; schedules to be developed at the regional or site level.

#### 4.4-4.19 (Reserved)

### 4.20 Status Assessment

AT operations during the DVRS installation will not be affected by the installation of the DVRS, with the exception of training. The contractor provided operations and maintenance training will be conducted on site and is sized for six people, at the discretion of the facility AT personnel be scheduled to attend the contractor training. It is planned that AT personnel will receive training by AF personnel certified on the DVRS.

## **5.0 SYSTEM CONFIGURATION AND ENGINEERING**

### **5.1 NAS Level Architecture**

The DVRS will replace aging analog voice recorders at FAA facilities requiring voice recording services. Voice switch to DVRS interfaces will provide connection between controller positions and the DVRS on a channel by channel basis. The DVRS will be flexible in design, allowing it to provide reliable high quality, and cost-effective voice recording services for the entire ATC environment.

#### **5.1.1 NAS Target State**

The DVRS is a direct COTS replacement of currently fielded multi-channel analog voice recorders meeting and exceeding performance requirements of NAS-SS-1000 with modern voice recording technology.

#### **5.1.2 Inter-program interfaces**

The DVRS will interface with all voice switch programs, i.e., WECO systems, ICSSs, RDVSSs, and VSCS, meeting all system level constraints. The VSCS program, providing voice switching at the ARTCCs, will be interfaced to the DVRS in the same manner as the High Capacity Voice Recorders (HCVR). The VSCS was designed to interface with the HCVR on a twenty (20) channel configuration, based on the HCVR. To reduce/minimize any rewiring at the facilities VSCS VDF the DVRS will utilize the same cabling laid in place to connect the VSCS via the VDF to the DVRS. A detailed description of the connectivity procedure between the two systems can be accessed at the Miami, Minneapolis, and Los Angeles ARTCCs where the DVRS has been installed.

### **5.2 Platform Architecture**

#### **5.2.1 Interim Platform Configuration**

All facilities of the NAS, with voice recording requirements, will have a DVRS installed/integrated over the term of the project. The DVRS configuration will be as installed, see Figures 5-1 and 5-2. See section 13.2.6.2 concerning Dual Operations requirements for relevant information on dual system operations.

#### **5.2.2 Target State Configuration**

The DVRS will be installed in a final configuration, voice switch interface to the DVRS will be through a demarcation point, a punch down block installed by the contractor, within the DVRS equipment rack(s), at the time of DVRS installation.

## 5.3 Subsystem Level Architecture

### 5.3.1 Hardware

Figures 5-1 and 5-2 provide diagrams for a single rack generic DVRS, sites that have requirements that exceed the single rack configuration will require space for a second or third rack of recorder equipment in the equipment room as the system, i.e., recorded channels, size dictates.

#### 5.3.1.1 Digital Recorder Unit (DRU) Theory of Operation

A simplified theory of operation for a DRU is an analog signal (e.g., voice, contact closure) is detected and triggers the digitization circuitry (A/D conversion) by the DRU. The DRU then creates a call file of the conversation. The conversations from beginning to end of each call file is time/date stamped. The call file time/date stamp will be synchronized externally by Global Positioning System (GPS) receivers with IRIG-B amplitude modulation time code for the DVRS. The DRU record modes can be selectable to continuous voice input, voice activated input, and line sensing. After the initial digitization, the bit stream may be compressed into the following techniques depending on the system setup. The techniques are summarized below:

- Pulse Code Modulation (PCM)
  - Waveform Coding
  - 8,000 samples/second X 8 bits/sample
  - 64 Kbits/second (1:1 compression)
- Adaptive Differential Pulse Code Modulation (ADPCM)
  - Waveform Coding
  - Encodes the difference between samples
  - 16 Kbits/second (4:1 compression)
  - 32 Kbits/second (2:1 compression)
- Vendor Proprietary
  - 8.0 Kbits/second (8:1 compression)
  - 9.5 Kbits/second
  - 13.0 Kbits/second

After compression, the call file which can be designated by alpha-numeric identification may (1) remain in the DRU's internal storage (e.g., buffer or hard disk drive) and then be transferred to long-term DATs after some specified time interval, or (2) be directly transferred to DAT. While stored in the DRU's internal storage, the call file can be searched for playback using channel, time/date, or a combination of both parameters. The call file's voice compression is first removed and then the subsequent digital bit stream undergoes digital to analog conversion resulting in audio output. Physical specifications are identified in paragraph 5.3.3.1. [Source: Hiram Escabi, cc:mail dtd 6/5/95]

#### 5.3.1.2 Reproducer Theory of Operation

The reproducer is designed for playback of call files and reproducing call files that have been recorded on DAT onto a standard cassette tape. Call files can be searched for playback using channel, time/date, or a combination of both parameters. The call file's voice compression is first removed and then the

subsequent digital bit stream undergoes digital to analog conversion resulting in audio output similar to the DRU. The reproducer has the capability to record the call file time stamp information onto the left channel and voice files onto the right channel of a two channel standard cassette player. The exact configuration of the DVRS reproducer will be at the discretion of each site, however, generic physical specifications are identified in paragraph

#### 5.3.1.3 GPS Antenna-Receiver

The DVRS contract provides for ordering a GPS to support a Coded Time Source (CTS) for time stamping of the FAA required voice communications. This GPS system can be ordered with optional interface equipment, where required, to support the facilities CTS requirements, see 5.3.1.4 and 5.3.1.5 below. The commercial off the shelf (COTS) GPS Antenna-Receiver will be configured with a standard IRIG-B time code output to the DRUs to synchronize the individual DRUs. As an option output expandability to include, but not limited to, the interfaces defined below will be available. This expandability will allow up to 9 DRUs to be interconnected, it will also allow for 5 additional output interfaces for use by the site. The antenna-receiver will include 500 feet of antenna cable, similar to RG-9 in terms of physical characteristics, and antenna mounting hardware. The contractor installation of the DVRS will include mounting/installing all GPS components and cable routing. [Source: DVRS DRAFT SOW, 5/26/95].

#### 5.3.1.4 IRIG E Interface

An IRIG-E (FAA Modified-600 Hz carrier) interface to provide an output to drive existing time code displays at current air traffic control facilities (Up to 300 Ft away) will be provided as required. Provided on the DVRS site worksheet form are blocks requiring facility information regarding IRIG-E, it is paramount that this information be provided to ensure the appropriate equipment(s) are ordered with the DVRS. [Source: DVRS DRAFT SOW, 5/26/95].

#### 5.3.1.5 RS-232 and 422 Interfaces

An RS-232 output to provide a digital timing signals to interface with future systems.. Provided on the DVRS site worksheet form are blocks requiring facility information regarding RS-232 and RS-422, it is paramount that this information be provided to ensure the appropriate equipment(s) are ordered with the DVRS. [Source: DVRS DRAFT SOW, 5/26/95].

#### 5.3.1.6 Uninterruptable Power Supply Equipment

The commercial off the shelf (COTS) Uninterruptable Power Supply (UPS), upon detecting an input ac power failure, will be capable of providing ac power for a minimum of 15 minutes, following a 24 hour recharging period, to the full load of the DVRS and ancillary equipment. The transition to and from UPS will not degrade the operational and performance capabilities of the DVRS and ancillary equipment. The UPS will be capable of being mounted in the equipment enclosure. [Source: DVRS DRAFT SOW, 5/26/95].

#### 5.3.1.7 AC Line Conditioning Equipment

The AC Primary Line Conditioner equipment shall reduce both the voltage and current distortion for the rack mounted DVRS equipment as measured at the connection to the AC primary line input. The AC

primary line conditioner equipment will constrain the rack mounted DVRS equipment to the following AC harmonic parameters:

- a) AC primary voltage harmonic distortion should not exceed 5%.
- b) Any odd order harmonic component for AC primary voltage should not exceed 3%.
- c) Total harmonic distortion for the AC primary current should not exceed 5%.
- d) Any odd order harmonic distortion component for current should not exceed 3%.

The AC Primary Line Conditioner will be capable of being mounted in the equipment enclosure. The commercial technical documentation will also be supplied.

### 5.3.2 Software

The DVRS software can be referred to as firmware that will be handled at the LRU level. System software upgrades will be delivered to the site for installation by AF personnel.

### 5.3.3 Physical Specification

#### 5.3.3.1 System Size

The DVRS will be flexible in capacity to support system sizes ranging from a minimum of 16 channels up to a maximum of 432 channels. The 432 channel limit is a contractually imposed constraint, vice a limitation of the system; contractual modifications can be made to modify this limit. System expansion will be accommodated by plugging channel board(s) or modules within a DRU and with additional DRU(s), as required. Each contract line item (CLIN) for a COTS multi-channel DVRS set of equipment for recording or reproducing will consist of the following functional items, with the exception of the GPS equipment(s), i.e., for facilities where a GPS system already exist to support the CTS a GPS will not be ordered with the DVRS. AND-320 will review the facility's GPS output to ensure the proper interface is available to provide the CTS to the DVRS

[Source: DVRS DRAFT SOW, 5/26/95]

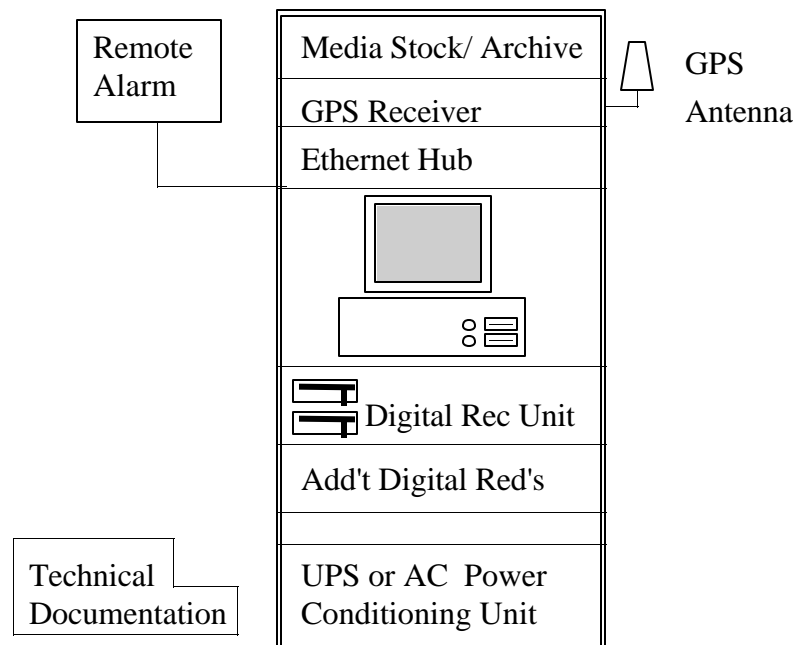
#### Recorder

- a) Multi-Channel Digital Recorder Unit (DRU)
- b) Control Interface/Workstation (PC, Keyboard w/Mouse, Monitor, and Speakers)
- c) External/Remote Audible Alarm and 500 feet of cable.
- d) Equipment Rack/Enclosure(s).
- e) GPS Receiver and 500 feet of cable.
- f) Ethernet Hub.
- g) Uninterrupted Power Supply Unit or AC Line Conditioner ( for Critical Bus Application).
- h) Archival Digital Storage Media (ADSM) media stock, and Cleaning Cartridge.
- i) 2 sets of Technical Instruction Documentation consisting of:
  - Air Traffic (AT) Quick Reference User Guide

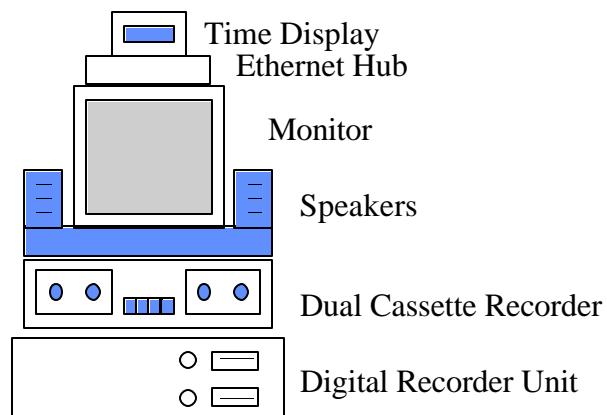
## Operations and Maintenance Manual

### Reproducer

- a) Multi-Channel Digital Recorder Unit (DRU).
- b) Control Interface/Workstation (PC, Keyboard w/Mouse, Monitor, and Speakers)
- c) Two-Channel Standard Cassette Player/Recorder.
- d) Ethernet Hub
- e) Visual Time Code Display.
- f) 2 each sets of Technical Instruction Documentation consisting of:  
Air Traffic (AT) Quick Reference User Guide  
Operations and Maintenance Manual



**Figure 5-1, DVRS Recorder**





**Figure 5-2, DVRS Reproducer**

Equipment Enclosures will house DRUs and all wiring necessary to interconnect the enclosed DRUs. The DVRS Recorder equipment rack(s), including sliding tracks, used to mount DRU(s) and associated equipment do not exceed 68 inches in overall height, 22 inches in overall frame width, and 26 inches in overall frame depth. The DRU and Reproducer equipment units do not exceed a pre-established 74 lb maximum. Loading conditions for a fully equipped DVRS DRU and Reproducer equipment enclosures should not exceed an average weight distribution of 175 lb/ft<sup>2</sup>. [Source: DVRS SOW, 3/10/95, p.10-11].

#### **5.4-5.19 (Reserved)**

#### **5.20 Status Assessment**

The Oakland Bay TRACON installation demonstrated that DVRS configuration and engineering specifications were within the stated requirements.

## **6.0 PHYSICAL FACILITIES**

### **6.1 Real Estate**

6.1.1 Real Estate Requirements - N/A

6.1.2 Real Estate Plans - N/A

### **6.2 Heating, Ventilation & Air Conditioning (HVAC)**

6.2.1 HVAC Requirements

The DVRS, to include all ancillary equipment as identified in paragraphs 5.3.1.7, operational temperature range is within the parameters defined in FAA-STD-032, Design Standards for National Airspace System Physical Facilities, paragraph 3.5.2, which specifies the same environmental requirements for spaces housing communications equipments.

6.2.2 HVAC Plans - N/A

### **6.3 Cables**

The DVRS cables will meet the requirements of FAA-G-2100F; paragraph 3.3.1.3.4.26.17. All cables, with attached cable connectors, required for installation, checkout, and operation, and any special purpose cables required for routine maintenance shall be provided. Where patch panels or plug-in boards are used in the equipment, the Contractor will provide plug and patch cables required for normal equipment operation. Cabling and wiring will comply with National Electric Code, NFPA-70. All interconnecting cables, when routed via a plenum, will be plenum-rated in accordance with NFPA-70 sections 725-38 and 800-53. Of particular note, the interface network cables (2), from DVRS recorder rack to DVRS reproducer equipment. This cable will be procured and installed by regional FAA personnel, at the discretion of the site. [Source: DVRS DRAFT SOW, 5/26/95]

6.3.1 Cable Routing/Raised Floor Requirements

The DVRS system does not require raised flooring to be installed, in the event that raised flooring exist at the facility the equipment rack will be accessible for sub-floor cabling.

6.3.2 Cable Plans

DVRS and ancillary equipment cabling plans will be developed and executed by the installation contractor. However, in the facilitization of the site in preparation of the delivery, it may be necessary for F&E personnel to review the installation plans provided by the contractor to conduct any wall and/or ceiling perforations required.

### **6.4 Power**

#### 6.4.1 Power Requirements

The DVRS equipment will perform fully in accordance with the requirement herein with a nominal line frequency of 60 and 50 Hz  $\pm$  6% , and a nominal voltage of 108 to 132 V A/C, single phase. The DVRS will provide a capability for the DRUs to remember last mode of operation and should automatically reinstate appropriate record operation after a power outage. Each DRU will not exceed a maximum power consumption of 400 watts. Each Reproducer will not exceed a maximum power consumption of 400 watts. [Source: DVRS DRAFT SOW, 5/26/95]

#### 6.4.2 Power Plans

The DVRS recorder equipment will require a standard 20 amp. 120 volt AC circuit for most installations. For the ARTCCs, where power requirements exceed the capabilities of a 20 amp circuit due to the number of DRUs and associated equipment, a 30 amp circuit is required. This service, 20 or 30 amp, may be provided by either the critical or essential bus. There is no unique requirement dictating which bus is to be the source for the system electrical power. The DVRS Reproducer equipment will require a 15 amp 120Volt AC circuit, a standard 3 wire wall plug is adequate.[Source: Conversation with Wes Boyd of AOS-260, NAILSMT Jan 23, 1996]}

AC cabling to the DVRS Recorder equipment rack location from the circuit breaker panel, designated to provide service to the DVRS recorder equipment is expected to be installed at the time of DVRS installation in the facility. The installation contractor will ensure that the AC power is off prior to the start of the installation.[Source: Draft DVRS Installation, Integration and Test Plan, dtd. 12/13/95}

### 6.5 Physical Safety & Security

#### 6.5.1 Security and Safety Requirements

The DVRS should not present any physical dangers to position operators or maintenance personnel. System safety engineering principles will apply in accordance with 3.3.6 of FAA-G-2100F.

#### 6.5.2 Security and Safety Plans and Procedures

No specific security or safety plan are called out in the DVRS specification.

### 6.6 Environmental / HAZMAT

#### 6.6.1 Environmental Monitoring/ HAZMAT Requirements

There may be a requirement to secure equipment to floors or run cables through walls that may contain asbestos. If either of these conditions exist, an asbestos mitigation plan will be required. During mitigation of asbestos materials there will be a requirement to comply with applicable local, state, and Federal monitoring requirements.

#### 6.6.1.2 Handling Hazardous Materials

The DVRS poses no environmental hazards (toxic materials or gases) to position operators or maintenance personnel. A mitigation plan for possible asbestos abatement will be coordinated with AND-320 for funding (see section 7.1.2 for site preparation funding information). Handling and mitigation of asbestos materials must comply with applicable local, state, and Federal requirements.

#### 6.6.2 Environmental Plans and Procedures

Hazardous materials will be identified by site/sector Airway Facilities, or regional Facilities and Equipment (F&E) personnel. A HAZMAT mitigation plan will be developed by regional F&E personnel which identifies procedures for handling and disposing of hazardous materials. Such activities will be funded as part of site preparation activities by AND-320 (refer to section 7.1.2, Site Preparation Funding).

### 6.7 Grounding, Bonding, Shielding & Lightning Protection

#### 6.7.1 Grounding, Bonding, Shielding & Lightning Protection Requirements

There are no unique requirements; National Electric Code is applicable.

#### 6.7.2 Grounding, Bonding, Shielding & Lightning Protection Plans - N/A

### 6.8 Space

#### 6.8.1 Space Requirements

The DVRS recorder equipment rack does not exceed 68 inches in overall height, 22 inches in overall frame width, and 26 inches in overall frame depth. For recording systems with ninety seven (97) to three hundred and thirty six channels two (2) recorder equipment racks will be required, basically doubling the space for one rack. And facilities with system/channel recording requirements in excess of three hundred and thirty six (336) will require three (3) equipment racks.

The DVRS Reproducer equipment is not configured, at installation, in an equipment rack, however, the equipment is rack mountable as delivered. The facility should acquire, for the Reproducer system, table top space or a cabinet suitable for placement/storing this equipment.

During any dual operations period it will be necessary to allow for the above space requirement(s) in addition to the existing analog recording equipment space allocation.

The installation contractor will require temporary space(s) for the storage of installation equipment and associated activities.

#### 6.8.2 Space Allocation Plans

Space allocation planning will be conducted at the regional level and coordinated through the AND-320 and the TOR where necessary.

## **6.9 Construction & Modification**

### **6.9.1 Construction and Modification Requirements**

Minimal facility modifications are expected, any activities required of the site in preparation for installation will be identified in the GSIP and SIP, i.e., GPS antenna location preparation and cable runs, any exterior and interior wall perforations and cabling, etc.

### **6.9.2 Construction and Modification**

No planning for construction or modification is required.

## **6.10 Telecommunications**

### **6.10.1 Telecommunications Requirements**

There are no telecommunication requirements established to date, the DVRS system software is not configured for remote maintenance monitoring (Remote Maintenance Monitoring).

### **6.10.2 Telecommunications Plans and Procedures - N/A**

## **6.11-6.19 (Reserved)**

## **6.20 Status Assessment**

The rack of DVRS recorder equipment has AC harmonic distortion that prevents it from directly interfacing the critical or the essential bus'. However, the rack of DVRS recorder equipment can be interfaced with the critical bus via a DVRS AC line conditioner; and with the essential bus via a small DVRS UPS. At this point the region will have to make a decision as to which bus will provide electrical power to the DVRS recorder. This information is to be provided with the site worksheet in order for ordering the appropriate equipment, i.e., AC line conditioner or UPS.

## **7.0 FINANCIAL RESOURCES**

### **7.1 Summary of Funding Plan**

New Digital Voice Recorder equipment and some site preparation will be funded under the Facilities and Equipment (F&E) budget. Operations and Maintenance (O&M) funds will be used for follow-on logistic support.

The DVRS project receives facilities and equipment funding from four main sources. The replacement of voice recording systems in existing towers is funded by AND-320, Voice Switching and Recording. The provision of voice recording systems for new, modernized, or relocated towers is funded by ANS-200, Facility Programs and Transition Division. Special projects will be funded by ANS-300, Special Programs Integration Division. Regional sponsored programs may also fund for additional equipment. AND-320, Voice Switching and Recording will be the line item manager for the other organizations, therefore, they must provide funds and ensure site preparation is complete. All of these programs have designated funding for specific sites. Sites requiring DVRS that do not appear on these list will have to be coordinated for inclusion with the Call for Estimate budget formulation or through ATR-100 for reprioritizing of sites.

Funds for site preparation activities, AND-320 funded sites only, will come from the program office, AND-320. A Project Authorization (PA) will normally be processed to the regions one year prior to installation. Levels of site preparation funding will be determined by AND-320 based on the average level of site preparation required.

AND-320 will fund for a one year extended warranty, beyond the one year of warranty that comes with the DVRS equipment, to allow ALM-100 time to budget for follow-on funding support.

#### **7.1.1 Regional Funding**

Funds provided to regional offices by AND-320 will be used for materials required during site preparation. The regions must program any additional funding required under activity 5 for labor and travel costs associated with site preparation.

#### **7.1.2 Site Preparation Funding**

Paragraph three (3) of 7.1 above identifies sourcing and scope of site preparation funding. AND-320 does not intend for site preparation funds to be used for labor costs, grounding upgrades to facilities (e.g. ground plane installation, counterpoise), modernization costs (e.g. painting, carpeting, patching/grouting, air conditioning).

## **7.2 Facilities and Equipment (F&E) Budget**

### **7.2.1 F&E Budget Requirements**

The acquisition of the DVRS Initial Phase will be funded with monies identified under the High Capacity Voice Recorder program (HCVR) CIP 22-11. Phase 1 and 2 will be funded with F&E funds starting in FY 97 under the Voice Recorder Replacement Program (VRRP), CIP # 62-11.

### **7.2.2 Summary of F&E Funding Status**

The DVRS funds are currently in the FY 97 budget process and none of the levels have been reduced to date. The 1997 budget is currently being presented for internal FAA approval in Function Working Group meetings. This is all contingent on the ARC approval. Detailed information about the DVRS funding can be obtained from AND-320.

## **7.3 Operations and Maintenance (O&M) Budget**

### **7.3.1 O&M Budget Requirements**

The full O&M budget requirements were determined in advance of contract award. The O&M budget requirements include a budget for depot maintenance and for stock replenishment of consumables and LRUs. Other budget requirements will be identified prior to DVRS implementation.

### **7.3.2 Summary of O&M Funding Status**

O&M Budget funding requirements were determined prior to contract award.

## **7.4 Research, Engineering and Development (RE&D) Budget**

Due to the COTS nature of this project a RE&D budget line has not been identified.

### **7.4.1 RE&D Budget Requirements (N/A)**

### **7.4.2 Summary of RE&D funding Status (N/A)**

## **7.5-7.19 (Reserved)**

## **7.20 Status Assessment**

There are no outstanding funding issues concerning the initial phase of the DVRS; no funding issues are anticipated for phases I & II.



## **8.0 HUMAN RESOURCES**

### **8.1 Human Resource Management**

#### **8.1.1 Impacts of Acquisition on Human Resource Management**

This section addresses the potential impacts of the DVRS on human resource management elements. The assessment of impacts is based on current understanding of the DVRS technical and operational requirements which may introduce temporary or permanent adjustments to facility or sector operations or may require administrative action at the facility or SMO level. Seven HRM elements are considered in this analysis: (1) personnel security; (2) relations with local communities; (3) relations with the aviation community; (4) employee work environment; (5) employee job satisfaction; (6) labor-management relations; and (7) organizational structure.

##### **8.1.1.1 Personnel Security**

The DVRS does not require changes to personnel security clearances. If the DVRS is located at a DoD site, FAA maintenance personnel may be subject to security processing requirements of the military installation. Security processing may be required for contractor personnel involved installation and test activities. Security personnel may be required to perform escort responsibilities.

##### **8.1.1.2 Relations with Local Communities - N/A**

##### **8.1.1.3 Relations with Aviation Community - N/A**

##### **8.1.1.4 Employee Work Environment**

DVRS specifications conform to military standards (MIL-H-46855) related to provision of work space, physical, visual and auditory links between personnel and equipment and safety provisions. No temporary or long-term adverse impacts on employee work environment are anticipated.

##### **8.1.1.5 Employee Job Satisfaction**

In terms of Airway Facilities personnel, the introduction of improved, state-of-the-art technology and attendant reduction, re: corrective maintenance and equipment operations, can be expected to contribute to employee job satisfaction.

##### **8.1.1.6 Labor-management Relations**

No Labor-management Relations issues unique to the DVRS project are anticipated.

##### **8.1.1.7 Organizational Structure**

No impacts to either Air Traffic or Airway Facilities organizations are anticipated.

### 8.1.2 Human Resource Implementation Strategies

Regional and facility/sector managers are advised to consider the following strategies for addressing human resource management impacts identified in section 8.1.1.

1. Identify facility/sector personnel for participation in DVRS implementation planning activities, identification of facility/sector procedural impacts, and development/revision of facility/sector procedures.
2. Provision of timely and accurate information regarding DVRS technical and operational features, site selection and installation activities and schedule to facility personnel.
3. Coordinate conduct of DVRS impact and implementation briefings with regional AXX-10 Office of Labor and Employee Relations.

### 8.1.3 Security Clearances

No budget requirements for security clearances for the DVRS project are indicated. Scheduling of contractor personnel who will be on-site for equipment installation and testing will be coordinated with FAA/USA security personnel. If FAA/USA personnel will be required as escorts, coordination with the appropriate FAA/USA offices should be considered.

## 8.2 Staffing

### 8.2.1 Impacts of Acquisition on Staffing

Two types of staffing impact are associated with DVRS implementation: Operational Workload and Implementation workload. The assessed impact in each of the two areas for airway facilities SMO and AT facility personnel are summarized below.

#### 8.2.1.1 Operational Workload

##### 8.2.1.1.1 Airway Facilities Workload

Operational workload associated with the DVRS is provided by the Airway Facility Sector Level Staffing Standard System. DVRS operational workload estimates provided in the staffing standard analysis system are described below:

Periodic maintenance on the current complement of analog voice recorders requires between 138 and 271 annual hours per recorder, including reel-to-reel tape change. According to FAA staffing standards, the annual cost to maintain the existing inventory of legal voice recorders is \$5.8 Million and requires 71.4 employee years. [Source: DVRS Mission Need Statement, Rev.2.]

A one year post commission estimate for non-recurring workload associated with the DVRS includes time against :

#### Non-Recurring Workload: Post-Commissioning

Joint Acceptance Inspection	80 hours
Additional Corrective Maintenance: Electronic	~ 4 hours - disconnecting MCVR(s)
Additional Corrective Maintenance: Environmental	~ 8 hours - removing MCVR(s)
In-house training; AF providing training to AT	< 24 hours / student
(This training is a region/site alternative)	< 24 hours / trainer / class

#### 8.2.1.1.2 Air Traffic Workload

No quantitative change in Air Traffic workload is associated with implementation of the DVRS.

#### 8.2.1.1.3 Flight Standards Workload

No quantitative change in Air Traffic workload is associated with implementation of the DVRS.

#### 8.2.1.1.4 Aviation Standards Workload

No quantitative change in Air Traffic workload is associated with implementation of the DVRS.

#### 8.2.1.2 Implementation Workload

##### 8.2.1.2.1 Airway Facilities

The Airway Facilities SMO Level Staffing Standard provides estimates of workload associated with a new system installation and/or system replacements. These estimates are for non-recurring workload prior to a system's commissioning and include F&E support (time for maintenance employees' involvement in installation to coordinate), initial training on new equipment. The staffing standard analysis of these workload elements for the DVRS are summarized below.

#### Non-recurring Implementation Workload Estimate:

F&E Support	~ 90 hours
New Equipment Training (AF)	~ 24 hours / student
Flight Inspection - N/A	

##### 8.2.1.2.2 Air Traffic

No quantitative change in Air Traffic workload is associated with implementation of the DVRS.

### 8.2.2 Staffing Plans

The implementation of the DVRS will reduce staffing requirements and support the regional consolidation of sectors through reduced maintenance.

### 8.2.3 Staffing Schedule - N/A

## 8.3 Training

### 8.3.1 Training Program

The DVRS is significantly different from current voice recorder, since it combines the functions of digital recording with the reduced size of the Digital Audio Tape (DAT). As a result, maintenance technicians and a small contingent of air traffic personnel will require training for this new equipment. [Source: DVRS ILSP, dtd 10/20/95]

The DVRS Training Course Number 48421 is for personnel responsible for the operations and maintenance, and consists of: theory of operation, system operation and evaluation, preventive maintenance procedures, and fault analysis. Laboratory sessions will provide the student with practical skills in system operating procedures, system evaluation, routine test procedures, adjustments, and fault isolation. The course length is approximately 24 hours. [Source: ALM-700 Memorandum to AF Division Managers, dtd Jan 18, 1996]

Attrition training alternatives are under evaluation for cost and curriculum.

#### 8.3.1.1 Airway Facilities Personnel

AF technicians will receive system operations and maintenance training on-site following equipment installation. [Source: DVRS ILSP, dtd 10/20/95]

AF maintenance technicians from each location receiving the DVRS will be provided operations and maintenance service training by the contractor on-site. [Source: DVRS ILSP, dtd 10/20/95]

The operations and maintenance system and service training will consist of theory of operation, system operation and evaluation, preventive maintenance procedures and fault analysis. Laboratory sessions will provide the student with practical skills in system operating procedures, system evaluation, routine test procedures, adjustments and fault isolation. [Source: DVRS ILSP, dtd 10/20/95]

#### 8.3.1.2 Air Traffic Personnel

AT training is required for the personnel responsible for changing and reproducing tapes and conducting quality control. AT personnel will be assigned two (2) quota in the Operations sections of the Operations and Maintenance Course. If no AT personnel are available for the Operations and Maintenance course, AF personnel will provide operator instructions to the AT personnel. [Source: DVRS ILSP, dtd 10/20/95].

### 8.3.2 Training Support

Second Level Engineering Training will be supported by AOS-260; Academy and FAALC personnel will receive engineering training at the Contractor's facility (Denro Inc.), this course of instruction will be the Operations and Maintenance training. [Source: DVRS ILSP, dtd 10/20/95]

### 8.3.3 Personnel Skills

Personnel assigned to be trainees for the system must be fully qualified electronic technicians, with experience on digital equipment and must be proficient in the use of electronic test equipment and common hand tools, or Air Traffic Specialist.

### 8.3.4 Training Quotas

DVRS training has been developed by the contractor. The DVRS Operations and Maintenance course is three (3) days duration. At each site, the contractor will provide AF & AT training. AT will be provided a quota of two (2) personnel per site, if personnel are available. The class size will be restricted to a total of 6 personnel. Additional classes can be ordered, if needed. AT will use cadre instructors for follow-on training, if no cadre instructors are available AF will provide the training.

The training courses provided are listed below:

a. The DVRS course #48241 is for personnel responsible for the operations and maintenance of the DVRSs and consists of theory of operation, system operation and evaluation, preventive maintenance procedures and fault analysis. Laboratory sessions will provide the student with practical skills in system operation procedures, system evaluation, routine test procedures, adjustments, and fault isolation.

b. Course Hours: 24 (estimated)

c. Numbers to be trained: site class size is 6

AF Field Personnel	4/facility
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AT Personnel	2/facility
--------------	------------

AOS-260	5/Contractors facility: DENRO, Inc.
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FAA Academy Instructors	3
-------------------------	---

FAA Headquarters	6
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### 8.3.5 Training Schedule

The facility class schedule is related to the delivery schedule. Installation of the DVRS will take 1.0 to 2.0 days. Training will begin immediately after the installation. The site AF personnel quota will be entered into the Consolidated Personnel Management Information System (CPMIS) as soon as the delivery schedules are finalized. Site quotas will be adjusted for those facilities where additional personnel are required to be trained, i.e., ARTCCs and larger TRACONs. (Source: DVRS ILSP)

### 8.4-8.19 (Reserved)

**8.20 Status Assessment**

The DVRS impacts on facility personnel and staffing requirements is expected to lessen the workload for preventative as well as corrective maintenance. Training quotas for the initial contractor provided training appear to be adequate.

## **9.0 Test Evaluation**

### **9.1 Overview of Test Activities**

The test and evaluation activities for the FAA Acquisition Pilot Program, Digital Voice Recorder System (DVRs), commercial off-the-shelf (COTS) acquisition has used streamlined acquisition test and evaluation procedures in concert with Section 5063 of the Federal Streamlining Act of 1994 using innovative test procedures for system testing, vendor demonstrations, examination of past performance, and operational site testing. There were test activities conducted prior to contract award to minimize technical risks.

#### **9.1.1 Government Test Activities**

Government test activities for the COTS DVRs equipment that took place prior to contract award consisted of several specific activities. Three different brands of COTS DVRs equipment were purchased for operational testing and evaluation at the Technical Center. One of those brands of COTS DVRs equipment was also tested and evaluated at the Los Angeles ATCT. During the solicitation sensitive streamlined acquisition process, hands on test and evaluation of a limited number of selected brands of proposed COTS DVRs equipment that were delivered and installed at the Stafford Building, FAA Academy, Oklahoma City, Oklahoma has been conducted. The Government evaluated and measured both operational capabilities and performance characteristics during Stage 2, Pre-evaluation/Qualification, of the streamlined acquisition process. The evaluation and testing during Stage 2 was similar to the classical Operational Test and Evaluation at the Technical Center. Additional evaluation and measurements were conducted by the Government on a down-sized number of selected brands of proposed DVRs equipment that were relocated from the Stafford Building to FAA Air Traffic Control operational facilities during Stage 3, Final Evaluation, of the streamlined acquisition process, prior to contract award. The evaluation and testing during Stage 3 was similar to the classical Shakedown Testing at the first operation site. Post award activities have included test and evaluation activities at a first operational site, Bay TRACON, to complete the Shakedown Testing that could not be completed prior to contract award.

#### **9.1.2 Contractor Test Activities**

Contractor test activities for the COTS DVRs equipment took place after contract award and consisted of the successful Offeror's normal internal testing in accordance with their internal Quality Assurance Plan. Post installation and integration testing at individual sites will be in accordance with their internal Quality Assurance Plan and the contractor provided and government approved On Site Installation, Integration, & Test Plan.

## **9.2 T&E Schedule**

The schedule for the conduct of a test program in relation to acquisition and site implementation milestones is not applicable to this streamlined acquisition of COTS DVRs equipment because there is no approved formal test program and there are no approved formal site implementation milestones other than those items clearly delineated in paragraphs 9.1.1 and 9.1.2 herein.

### **9.3 T&E Responsibility Matrix**

#### **9.3.1 Government Test Organization**

The content of the Government Test Organization for those activities prior to contract award is solicitation sensitive and can not be provided. The content of the Government Test Organization for those activities post contract award is not formally approved but in fact consists of the classically normal elements of ACW-400 and AOS-200 working together with applicable elements of the regions and Washington Headquarters Integrated Product Team (IPT). Steve Curran of ACW-400, is the IPT member that has the lead in test activities.

#### **9.3.2 Contractor Test Organization**

The content of the Contractor Test Organization for post contract award activities is not available at this time because the contract does not require the Offeror to provide such information.

### **9.4 T&E Field Support Requirements**

#### **9.4.1 Personnel Requirements**

The numbers and type of FAA personnel required to support Government and Contractor test and evaluation activities for those activities conducted prior to contract award is solicitation sensitive and can not be provided. Very limited unique training was provided on the specific COTS DVRS equipment. The numbers and type of FAA personnel required to support Government and Contractor test and evaluation activities for those activities conducted post contract award is not formally approved but in fact consists of the classically normal elements of ACW-400 and AOS-200 working together with applicable elements of the regions and Washington Headquarters Integrated Product Team (IPT). Steve Curran of ACW-400, is the IPT member that has the lead in test activities. The Contractor will provide on-site operation and maintenance training at each FAA site at the completion of their installation, integration, and testing as ordered by the Contracting Officer. The Contractor will train up to six (6) students at each FAA site. The training schedule for each FAA will be provided upon contract modification.

#### **9.4.2 Test Equipment Requirements**

Special test tools and test equipment are not required to fault isolate or to perform removal and replacement of failed Line Replaceable Units (LRUs). It is anticipated that any tools and test equipment required are already on-site as standard tools and test equipment.

#### **9.4.3 System Access**

Requirements for access to the site DVRS equipment for conduct of testing continue at the conclusion of the contractor installation. The schedule for and projected duration of access requirements will be approximately 1/2 day at the conclusion of the contractor installation. It is anticipated that the duration will be no more than a few hours.

#### **9.4.4 Space Requirements**



The facility space requirement to support testing requirements consists of a small amount of existing floor space around the DVRS equipment to conduct testing. It is anticipated that the facility space requirement to support testing requirements will be very limited, if any.

## **9.5 T&E Activities Status**

### **9.5.1 Test Results Summary**

The outcomes of the Government test activities for the COTS DVRS equipment that took place prior to contract award consisted of several specific results. The outcomes of the testing activities of the three different brands of COTS DVRS equipment that were purchased for operational testing and evaluation at the Technical Center was not formalized in a report but was considered successful enough to proceed with the streamlined acquisition of COTS DVRS equipment. The outcome of the testing activities of the one of those brands of COTS DVRS equipment that was tested and evaluated at the Los Angeles ATCT was not formalized in a report but was considered successful enough to proceed with the streamlined acquisition of COTS DVRS equipment. During the solicitation sensitive streamlined acquisition process, the outcomes of the testing activities of the hands on test and evaluation of a limited number of selected brands of proposed COTS DVRS equipment that were delivered and installed at the Stafford Building, FAA Academy, Oklahoma City, Oklahoma can not be provided because it is solicitation sensitive but was considered successful enough to proceed with the streamlined acquisition of COTS DVRS equipment. The outcomes of the Government test activities for the COTS DVRS equipment that were conducted by the Government for a down-sized number of selected brands of proposed DVRS equipment that were relocated from the Stafford Building to FAA Air Traffic Control operational facilities during Stage 3, Final Evaluation, can not be provided because it is solicitation sensitive but was considered successful enough to proceed with the streamlined acquisition of COTS DVRS equipment.

### **9.5.2 Outstanding Program Trouble Reports (PTR)**

There are no critical PTR's or actions being taken to resolve them.

### **9.5.3 Discrepancy Correction Process**

The process for resolving test discrepancies in the post contract award environment, consists of identifying the discrepancy, working with the contractor to identify a solution to the discrepancy, initiating a NAS Change Proposal (NCP), if required, completing the Configuration Control Board process, if there is a NCP required, and modifying the contract to effect resolution to the test discrepancy, as mandated in the classical approach to resolve test discrepancies..

## **9.6-9.19 (Reserved)**

## **9.20 Status Assessment**

The DVRS test post contract award and first site shakedown activities yielded no critical items disallowing the deployment of the system.



## **10.0 SYSTEM SUPPORT**

### **10.1 System Support Concept**

#### **10.1.1 Hardware**

The DVRS hardware equipment will be supported using two levels of maintenance: field and depot.

1.) Field Maintenance Field maintenance will be performed by FAA technicians and consists of troubleshooting the failure to the line replaceable unit (LRU) level, replacing it with a serviceable LRU and certifying the repair. Preventive field maintenance will be performed in accordance with performance checks specified in FAA Order 6670.4E, Maintenance of Multi-channel Voice Recorder Equipment. This order is being updated by AOS-260. Note: AOS-260 will issue a notice which will outline the preventive maintenance checks until FAA Order 6670.4E is published. (DVRS ILSP)

The FAA will assume field maintenance responsibilities when the following have been met:

- a. Field technicians have been trained;
- b. Tools and test equipment, if required are available and on-site.
- c. Approved technical instruction books on site.

2.) Depot Maintenance The depot maintenance concept is contractor repair provided through a two year extended warranty in addition to the basic one year warranty for a total of three years. during this warranty period, the FAALC and Communications Life Cycle Division will evaluate the supportability and determine the appropriate life cycle support. (DVRS ILSP)

#### **10.1.2 Software**

The DVRS software is vendor proprietary and as such no field level maintenance will be performed to upgrade, or in any way modify the software. The DVRS software can be referred to as firmware that will be handled at the LRU level. System software upgrades will be delivered to the site for installation by AF personnel. [Source: Hiram Escabi Phone conversation - 6/15/95]

### **10.2 Special Support Facilities**

#### **10.2.1 Mike Monroney Aeronautical Center**

##### **10.2.1.1 Restoration Response Level**

The Logistics Center will provide Warranty Management service, including an Item Manager, for the DVRS. This service will be staffed 24 hours per day, 7 days per week in order to receive warranty requirements from FAA sites.

The Item Manager can be reached during the hours of 0800 to 1630. During non-duty hours, the FAALC priority desk will provide the required warranty service interface.

The FAA sites will use the Logistics and Inventory System (LIS) to requisition replenishment parts through the FAALC.

The Product Team has established the following operating policy as guidance in determining when it is appropriate to use Priority 1 (P1), Priority 2 (P2), or Priority 5 (P5). A general definition of each is as follows:

- a) Priority 1 is emergency replacement which shall require the shipment of serviceable LRUs so that they are received at the FAA site where required, within 24 hours, after receipt of a telephonic request from the FAA Logistics Center official designated in writing.
- b) Priority 2 is replacement which shall require the shipment of serviceable LRUs so that they are received at the FAA site where required, within 48 hours, after receipt of a telephonic request from the FAA Logistics Center official designated in writing.
- c) Priority 5 is routine repair which shall be completed within thirty (30) calendar days after receipt of a failed LRU by the Contractor

The following DVRS Warranty Service Operating Policy was made effective May 1, 1996:

- a) Non-commissioned sites should receive P2 or P5 Warranty service only.
- b) Commissioned sites may use P1, P2, or P5 utilizing the following guidance:

**Justification for P1:** P1 should be used if there is a high potential for creating a major disruption in the recording of voice communications between air traffic controllers and pilots.

**Conditions for P1:** The DVRS in non-operational and the item is not carried as a site/SMO spared item, or in the case of a spared item, the site/SMO spare has been previously used.

**Justification for P2:** P2 should be used if there is a potential for creating a disruption in the recording of voice communications between air traffic controllers and pilots.

**Conditions for P2:** The DVRS in non-operational and the only site/SMO spare is used to make this system operational.

- c) P5 may be used for routine repairs when the above conditions do not apply.
- d) The site supervisor is responsible for ensuring that all requisitioners are aware of their responsibilities to avoid the use of unjustified or unnecessary high priorities. The site supervisor has approval authority for determining whether the Urgency of Need justifies a P1, P2, or P5.
- e) The FAA site sends the requisition to the Item Manager (FAALC Official) through the LIS using DVRS as the APP code for action. During non-duty hours the FAALC priority desk will take the necessary action.
- f) The requisition will be sent to Denro utilizing the warranty Response Service hotline.

(Source: CC:Mail, Author Ms. Sue Handy AND-320, Subject: DVRS Warranty Operations Policy, dtd: May 10, 1996.)

#### 10.2.1.2 Field Level Maintenance

See paragraph 10.1.1 - 1.

#### 10.2.1.3 Depot Level Maintenance

See paragraph 10.1.1 - 2.

#### 10.2.1.4 Engineering Support

Second level engineering support will be managed by AOS-200 and technical assistance will be provided by the contractor. A toll-free number will be established to respond and log problem calls. [Source: DVRS ILSP, dtd. 6/15/95]

### 10.2.2 FAA Technical Center

The FAA Technical center was involved in the DVRS test and evaluation phases of the pre-contract award process. The FAA Technical is not expected at this time to perform any further system support activities for the DVRS project. [Source: DVRS ILSP, dtd. 6/15/95]

#### 10.2.2.1 Restoration Response Level

This section is not applicable to this document.

#### 10.2.2.2 Field Level Maintenance

This section is not applicable to this document.

#### 10.2.2.3 Depot Level Maintenance

This section is not applicable to this document.

#### 10.2.2.4 Engineering Support

This section is not applicable to this document

### 10.2.3 Other Special Support Facilities

No special support facilities have been identified or are expected in support of the DVRS project.

## 10.3 Materiel Support

### 10.3.1 Project Materiel

This section describes the methods used for supplying spare and repair parts for maintenance of DVRS equipment, and includes the planned method for obtaining and storing spare parts, both common and parts-peculiar, needed to support the maintenance activities.

- 1) Site Spares: A detailed analysis of the reliability, maintainability of the DVRS has resulted in the following recommendations. Initial site spares will be provided to all ARTCCs, Level IV and V facilities, CERAPs and selected remote locations. Additionally, site spares will be provided to selected System Maintenance Office (SMO) or Work Center (WC) in each region. The determination of which SMOs or WCs will be coordinated with the appropriate RAPM.

This site sparing methodology will be re-evaluated after a one year period. Operational availability levels will be closely monitored. if required, additional spares will be allocated to meet the life cycle support requirements of the DVRS.

The Manager, Air Traffic Safety and Training Division, ATX 100, concured with the above stated sparing policy in his memorandum dated April 12, 1996, subject: ACTION: Digital Voice Recorder System (DVRS).

Table 10-1 identifies site spares in quantities of one each will be provided to the selected locations discussed in the above procedures. (DVRS ILSP, dtd 1/24/96)

Part	Part Number
ADIF Board	503A0019-1A
ALI Board	503A001-6A
Hard Drive	1080S
CPU Board	AX80U86/486
APA-4 Board	503A0003-3A
Power Supply	SQT-4254C
SCSI Card	A11A-1542CF
VGA Card	8900D

**Table 10-1 Spares for Selected Locations**

Note: Depot Spares: Depot spares will be stocked by Denro during the warranty period. (DVRS ILSP)

### 10.3.2 Provisions and Supply Support

The Provisioning Conference has not been held to date, the DVRS Program Office (AND-320), FAALC, and ALM-700 are presently looking at the lifecycle support requirements and options for the future support of the DVRS after the warranty period has expired.

### 10.3.3 Packaging Transportation and Storage

The DVRS contractor will ship all system components to be installed at the site. The shipment will be received by FAA personnel. Installation of the equipment will be completed within fifteen (15) days after delivery. The delivering contractor will locate the equipment in place. In the event that the installation contractor is not on site at time of equipment arrival the delivering contractor will place the equipment at the direction of the FAA site personnel. [Source: DVRS Section F, dtd, 6/15/95]

Site spares will be shipped directly to sites with the DVRS from the contractor, spares will be packaged IAW ASTM-D-3951 Standard Practice for Commercial Packaging, and marked IAW supplemental requirements. [Source: DVRS ILSP, dtd, 6/15/95]

All items identified as electrostatic discharge sensitive, will be preserved/packaged/packed and marked IAW ASTM-D-3951. [Source: DVRS ILSP, dtd, 6/15/95]

## 10.4 Technical Documentation

### 10.4.1 Hardware Documentation

The contractor is responsible for developing commercial instruction books prepared IAW Appendix I of FAA-D-2494/b, Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment, Requirements for Preparation of Manuscript and Production of Books. Two copies of the instruction book will be provided to each site receiving the DVRS. See section 5.3.3 for additional information.

### 10.4.2 Software Documentation

No delivery of software documentation will be provided.

### 10.4.3 Procedural Documentation

The contractor is responsible for providing an Air Traffic Quick Reference Guide which provides a ready reference of system functions and uses of all operational hardware and software. Two copies of this user guide will be provided to each site receiving the DVRS. See section 5.3.3 for additional information.

## 10.5 Site Procured Implementation Items/Tools

### 10.5.1 Site Procured Implementation Items/Cables

The following items have been described as a "Shopping List", i.e., items to be purchased by the FAA for integration of a DVR into a facility. An action item in the Voice Switching and Recording Conference in San Diego directed that these items be included within the PIP.

Note that ARTCCs may require a second Ethernet Hub if the recorder to reproducer ethernet cable run exceeds 100 meters

Site preparation funds are to be used to cover the approximately \$300.00 cost of all the items listed.

Test cables will be used for performance verification. Possible sources for the cables are listed below. If the cables are already on site new ones are not needed. The following test cables will be needed for the DVRS:

- \* Miniature Phone Plug (Mini-Bantam)- Telco 310 Male (Send/receive tones through FAA patch panel)
- \* RCA Phone Plug (Male) - Telco 310 Male (Send test signals to speaker system)  
NOTE: Wired RCA Male tip to Telco 310 Tip  
Wired RCA Male Sleeve to Telco 310 Ring
- \* RCA Phono Jack (Female)- Telco 310 Male (Measure signal levels from DRU)  
NOTE: Wired RCA Female Sleeve to Telco 310 Ring  
Wired RCA Female Tip to Telco 310 Tip
- \* 1/8" Mini Stereo - Telco 310 Male (Measure output of speaker system)  
NOTE: Wired Miniature Stereo Tip and Ring to Telco 310 Tip  
Wired Miniature Stereo Sleeve Telco 310 Ring
- \* Clip Leads - Telco 310 Male (Send tones to/from DVR 66 blocks)  
NOTE: Red Clip Lead wired to Tip,  
Black Clip Lead wired to Ring



### TEST CABLES AND CONNECTORS

Part	Manufacturer	Part Number	Description	Quantity
Telco 310 male Bantam male	Pomona	4280-60	60" Patch cable to send tones between Patch Panel (s) and test equipment.	2
Telco 310 - Clip Leads	Pomona	4812-J-60	60" Patch cable to send tones from test equipment into 66-block(s).	2
Phono Plug Telco (WE) 310	Switchcraft	482	Connector used to construct test cable	2
RCA Phono adapter jack-jack (female-female)	Switchcraft	349A	To be used to convert phono plug into phono jack	1
RCA Phono plug (male)	Switchcraft	3501M	Connector used to construct test cable	1
.141" Mini-Stereo stereo phono plug	America or Cambridge (Distributor)	AJ-2612 or #090-289 (Cambridge part #)	Connector used to construct test cable	1
Cable 2 conductor twisted pair shielded	Cooper/Belden	8450	Outer diameter .118" used to construct test cable	1 100' spool

**Table 10-2 Test Cables**

#### 10.5.2 Implementation Maintenance Items/Tools

The following tools will be needed for maintenance of the DVR. Suggested sources have been included if the site does not already have the tools on hand.

Part	Manufacturer	Part Number	Description	Quantity
Metric Nut Driver	Xcelite	8MM	8 mm	1
Screwdriver	Xcelite	CR1	Phillips and Blade	1
Small Crescent Wrench	Xcelite	44CG	4" jaw 0.5" opening	1
Needle Nose pliers	Xcelite	LN775-5 1/2C	5-1/2" length 1-3/16" opening	1
Diagonal Cutters	Xcelite	74CG	4" length	1

**Table 10-3 Maintenance Tools**

NOTE: Tools that are used for the installation, maintenance and repair of Personal Computers have proved helpful in the maintenance of the DRU's and computer work stations.

### 10.5.3 Audio Bus Items/Parts

The following equipment will be needed to construct the audio bus between the reproducer and recorder stations. Possible sources are included. The audio bus should be connected as described in the attached figure.

Item	Part	Manufacturer	Part Number	Description	Quantity
1	Modular Jack-Jack Adapter	SPC Technology	TA-7-4	2 RJ-11 Jacks 6 position, 4 conductor	1 logger 1 2-9 loggers 3
2	Modular Plug	SPC Technology	TA-24	RJ-11 Plug 6 position, 4 conductor	1 logger 4 2-9 loggers 4n+6 n=# of loggers
3	Telephone Y Adapter	SPC Technology	Type TA-8-4	RJ-11 2 jacks 1 plug 6 pos. 4 con.	1
4	5 outlet modular tap	SPC Technology	TA37-5	5 RJ-11 Jacks - 1 RJ-11 Plug 6 pos. 4 con.	1 logger 0 2-5 loggers 2 6-9 loggers 4
5	Modular Crimping Tool	SPC Technology	Type TA-28	Crimps 4,6 conductor RJ-11, RJ-12 and RJ-14	1
6	Telephone Cable Plenum Rated	AT&T	Com Code 105287015	2 pair Category 3 Audio (twisted pair), used for interconnect between rep. and rec.	1M' (sold in 1000 foot rolls)
7	Silver Satin Line Cord	AIM	Carlton Bates # 65-TF224M-4	4 Wire Silver Satin base cord (bulk)	1M' (sold in 1000 foot rolls)

**Table 10-4 Audio Bus Parts**

The following equipment will be necessary to construct the LAN network interconnect between the recorder and reproducer stations. Possible sources are included if the materials needed are not on site.

Part	Manufacturer	Part Number	Description	Quantity
Modular Plug (SPC Technology)	SPC Technology	TA-31-8	8 conductor RJ-45 Non-keyed Plug	10
Modular Crimping Tool	SPC Technology	Type TA-29	Crimps 8 Pin Modular Plugs RJ- 45 (TA-31)	1
LAN Cable Plenum	AT&T	2003	4 pair, Category 3 (10 MB/s LAN)	1M' (sold in 1000 foot rolls)

**Table 10.5 LAN Interconnection Parts**

NOTE: The LAN cable between the Reproducer Area Hub and the first Recorder Area Hub cannot exceed 100 meters in length. There should be NO cross connects involved, and the cable should be a direct run with no other cable plant involved. If it is necessary to cross connect, each 66 block involved will shorten the 100 meter length by approximately 50 feet. If there is any change in wire gauge, or other discontinuities, these will also shorten the 100 meter limit as well.

NOTE: The LAN cables MUST be twisted pair cable of the type specified.

NOTE: This type of connection is to be used only in the ARTCC environment, where the cable length limit of 100 meters cannot be met. This type of connection can be used to extend the limit to 200 meters, for one time only. If the connection cannot be made within the constraints of this diagram, then contact AOS-200 with site specific information so that the appropriate solution can be provided.

<b>Part</b>	<b>Description</b>	<b>Quantity</b>
Cassette Cleaning Cartridge		At least one.
TTS-44, or HP-4935A, or Equivalent	Transmission Test set	At least one.
50 Pin Telco Cable	Male-Female from Denro 600 ohm terminated 66-blocks to FAA patch Panel	1 for every 24 DVR input channels

Table 10-6 Accessories

[Source: Wesley Boyd cc:mail - DVR "Shopping List", dtd 1/5/96]

## **10.6-19 (Reserved)**

### **10.20 Status Assessment**

System support documentation will be delivered with or prior to the DVRS; support documentation will include, but not limited to: Installation, Integration and Test Plan (contractor provided), Operations and Maintenance Manual, Air Traffic Quick Reference Guide, and commercial documentation on all the COTS components.



## **11.0 PROJECT SCHEDULE INFORMATION**

### **11.1 NAS Implementation Schedule**

#### **11.1.1 Deliveries and Installation**

The contractor will deliver the DVRS and ancillary equipment thirty (30) days after receipt of a contract modification. The Government desires delivery of a maximum of eleven (11) systems per month. Installations are expected to average between four (4) and eight (8) per month.

Installation of the DVRS equipment will be completed within fifteen (15) days after the equipment is delivered to the site. Spare parts kits, in accordance with the sparing plan, ordered in conjunction with system delivery or system delivery and installation will be delivered with the system.

Operator and maintenance training classes will be conducted concurrently with installation of equipment. Engineering training will be scheduled and conducted as ordered.

Documentation will be delivered in accordance with instructions provided on the appropriate CDRL. [Source: DVRS Deliveries and Performance - Section F, dtd 6/14/95].

### **11.2 Deployment Schedule**

A proposed list of radar facilities that were not consolidated under the Area Control Facility concept was developed by the System Plans and Programs Division, ATR-100, for the Initial Phase, as the final portion of the CIP project 22-11 and forwarded to the Voice Switch and Recording Product Line, AND-320, for final coordination with the regions and the DVRS contractor. The list of the Initial Phase facilities is provided in Appendix D, Site Deployment Schedule as is the listing of the DoD Army Sites. The Initial Phase (FAA Sites only) listing is organized by order of installation and by region. After the decision to deploy DVRS is made a ramp-up period is expected to develop an actual delivery schedule. The average installation period, contractor on-site time to include initial operations and maintenance training, is expected to be three (3) to five (5) days for small to medium sized systems, and five (5) to ten (10) days for the larger systems. The proposed list of FAA facilities for phase 1 and 2 will be developed as part of the new CIP project and included in a revision to Appendix D. The DoD, Army, provided their list of facilities which is also provided in Appendix D. The DoD Air Force and Navy list of facilities may be provided at a future time when those organizations make their decision with respect to utilizing the FAA contract vehicle.

The Materials Delivery Forecast Module (MDFM) provides the most current delivery dates.

### **11.3 Site Implementation Schedule**

Site major implementation milestones will be determined by the regional Airway Facilities division staff personnel on a site-by-site basis. A generic timeline for each major implementation milestone is contained in Appendix A. Individual sites may adjust this GSIP based on experience and the unique

features of a specific site's implementation. Estimated times are provided below, all times are given in working days.

Implementation Planning by Region/Facility:	1.0
Pre-INCO by Region/Facility:	1.0*
INCO by Contractor:	1.5-5.0
Integration by Contractor:	0.5
Training by Contractor:	3.0
Field Shakedown:	1.0
Dual Operations by Region/Facility:	3.0
Equipment Removal by Region/Facility:	1.0**

**TABLE 11-1 Site Implementation Activities Estimates**

\*Physical Site Surveys by the contractor are not a requirement but may be conducted at the discretion of the contractor as coordinated with the specific site. Site preparation by the Government is minimal such as identifying the location for the contractor installation, clearing the existing floor space, identifying an existing AC branch circuit, and identifying the existing voice circuit demarcation terminals.

\*\* Removal of surplus equipment will be accomplished by regional/facility personnel at the discretion of the specific property custodian.

The time between the Regional Implementation Planning and the Pre-INCO milestone will vary from facility to facility and region to region depending on unique internal Government priorities and those resources available to complete certain tasks. For the same reason the time intervals will vary between Pre-INCO milestone and the INCO milestone, and the time between the Dual Operations milestone and the Equipment Removal milestone. The time between the INCO milestone and the Integration milestone, and the Integration milestone and the Field Shakedown and Training milestone is zero because they are continuous contractor provided activities. The time between the Field Shakedown and Training milestone and the Dual Operations milestone is zero because the existing voice recorders must continue in operation to provide legal recording until such time as the region/facility has confidence in the operation and maintenance of the new digital voice recorders.

#### **11.4 Schedule Dependencies**

The DVRS implementation schedule has been developed to coincide with new system(s) deployments, i.e., new ATCT and TRACONs to allow for the most efficient use of all resources. In the case of ARTCC deployments, the DVRS delivery schedule is independent of the voice switch deployed. However, the delivery schedule will be adjusted in accordance with the needs of the NAS.

**11.5-11.19 (Reserved)****11.20 Status Assessment**

Final site deployment and implementation schedules will promulgated in the Materiel Delivery Forecast Module (MDFM). Calender year 1996 has installation dates in September through December that are not reserved/scheduled, AND-320 is coordinating with ATR and the Regions to fill those installation dates. No impact on site implementation is anticipated.





## **12.0 ADMINISTRATION**

### **12.1 Acquisition Summary**

The Digital Voice Recorder System (DVRS) acquisition will be a comprehensive legal recorder replacement project, providing highly reliable digital legal recording capability in facilities with aging (1970s and earlier) analog reel to reel voice recorders.

#### **12.1.1 Market Survey**

In September of 1993, the acquisition office for voice switching and recording began inquiries into the commercial availability and viability of digital voice recorders. Known US and non-US manufacturers of digital recorders were contacted to determine the potential for using the equipment in the air traffic environment. In March of 1994, procurement of three digital recorders from three different manufacturers was initiated. Results from FAATC testing indicated that COTS digital recorder units meet or exceed most analog recorder performance requirements. The operational performance and suitability of the digital voice recorders were also investigated and proved to be successful as a result of the installation and operational testing of a product in the Los Angeles Air Traffic Control Tower.

#### **12.1.2 Acquisition Strategy**

The acquisition strategy for the FAA Acquisition Pilot Program, Digital Voice Recorder System (DVRS), commercial off-the-shelf (COTS) acquisition has used streamlined acquisition procedures in concert with Section 5063 of the Federal Streamlining Act of 1994 using alternative and innovative procurement procedures. The DVRS acquisition will involve a three phase procurement to replace existing legal recording capability for: (1) radar facilities not consolidated under the Area Control Facility (ACF) concept, (2) low to mid-size terminal facilities, automated flight service stations (AFSS), and flight service stations (FSS), and (3) air route traffic control centers (ARTCC) and planned metroplex control facilities (MCF).

### **12.2 Contracting Information**

The DVRS contract includes Contract Line Item Numbers (CLINs) for: project management, DVRS equipment sized in 16 channel increments up to 432 channels, installation and on site operational/maintenance training for the DVRS equipment, ancillary equipment such as GPS antenna & receiver, uninterruptable power supply (UPS), AC line conditioner, channel card expansion kit, individual line replacement units (LRUs) for use as on site spares, depot spares, or replacement LRUs, extended warranty, various logistics items, contractor repair service, technical assistance, and engineering training, in a standard contract format with several optional periods.

#### **12.2.1 Prime Contract**

On August 4, 1995 DENRO was awarded the contract for DVRS and as such is the prime contractor.

### 12.2.2 Service Contract

This paragraph and subparagraphs are not applicable to this streamlined acquisition of COTS DVRS equipment because this project is not funded for a service contract.

### 12.2.3 Project Support Contracts

Contract DTFA01-93-C-00010

Information Systems & Networks Corporation

10411 Motor City Drive

Bethesda, Maryland 20817

### 12.2.4 Regional Contracting

This paragraph and subparagraphs are not applicable to this streamlined acquisition of COTS DVRS equipment because this project is not funded for regional contracting.

### 12.2.5 GFP/GFI/GFE Obligations

This paragraph and subparagraphs are not applicable to this streamlined acquisition of COTS DVRS equipment because there are no GFP/GFI/GFE obligations.

## **12.3 Project Management (PM)**

The AND-300 Integrated Product Teams (IPT) Voice Switching and Recording Product Line, AND-320, will manage this project.

### 12.3.1 Project Charter

This paragraph is not applicable to this streamlined acquisition of COTS DVRS equipment because there is no Project Charter.

### 12.3.2 Integrated Project Team (IPT)

Table 12-1 identifies members of the Communications IPT with responsibility for DVRS management or implementation. Other, non-headquarters organizations/individuals with support responsibilities include Regional Associate Program Managers (RAPMs), Operational Support Services Personnel, and FAATC personnel.

POSITION	NAME/ORGANIZATION	PHONE NUMBER
IPT Leader	Arthur Feinburg	
DVRS IPT Lead	Stephen Dash	(202) 358-5041
Contracting Officer	Susan Handy	(202) 358-5083
AND-320 Business Manager	Jay Egbert	(202) 358-73
Engineering Lead	Roger Smith	(202) 358-5047
ARTCCs & System Scheduling	Andy Michel	(202) 358-5046
AT Requirements	Susan Bryant	(202) 267-9175
Logistics Lead	George Clark	(202) 358-5061
NAS Implementation Specialist	Kevin Trombley	(202) 651-3182

**Table 12-1 IPT Members**

### 12.3.3 Project Status Report

The Project Status Report (PSR) is available on line from the Project Material Management System (PMMS) and will be updated as soon as new information becomes available at time of contract modifications.

### 12.3.4 Exception Management

It is the intention of the DVRS project management that there be a free exchange of ideas between the Contractor and the government on all issues relating to the DVRS project in order to establish project progress, identify and resolve issues. Technical Interchange Meetings (TIMs) may be held at the request of the government or the Contractor to discuss in detail any technical or NAILS issues that require resolution or further clarification.

Implementation and transition issues that may arise during the initial fielding of the DVRS will be resolved via the Transition Information Exchanges (TIEs) as they are identified. TIEs will be conducted by the Product Team Lead or the Associate Program Manager for NAS Implementation (NAS Implementation Specialist). Resolution of implementation issues identified during the TIE will be incorporated into the next revision of the PIP. [Source: Implementation Process Guidelines, dtd 6/94]

#### 12.3.4.1 DRR Process

AND-320 has the primary responsibility to ensure that the Deployment Readiness Review (DRR) for the DVRS is conducted per Order 1800.63, National Airspace System Deployment Readiness Review Program. The DRR process ensures that the DVRS is ready to be integrated into the NAS and that the FAA is ready to receive, utilize, and provide life-cycle support for the DVRS.

The process is based on the premise that a team of knowledgeable individuals can review a new project and establish items of concern. These items are then translated into action items, which when completed, result in a deployable system. The mechanism for recording these items of concern and action items is known as a DRR Checklist and the knowledgeable members who identify the items of concern are known as the DRR Team. The Product Lead initiates the DRR process with a system

status and subsequently pre-briefs the final report to AAF-1. The final report is submitted by the service director to the DRR Executive Committee (EXCOM) chairman prior to the DRR EXCOM meeting. The DRR EXCOM was held on January 11, 1996; AAF-1 made to decision to deploy the DVRS.

## **12.4 Quality Assurance**

Quality Assurance will be managed by the Quality Assurance sub-team member, ASU-420, of the associated integrated matrix team supporting the Integrated Product Team, sub-team, Voice Switching and Recording, AND-320.

### **12.4.1 Project Acceptance Criteria**

The test and evaluation activities for the FAA Acquisition Pilot Program, Digital Voice Recorder System (DVRS), commercial off-the-shelf (COTS) acquisition has used streamlined acquisition test and evaluation procedures in concert with Section 5063 of the Federal Streamlining Act of 1994 using innovative test procedures for system testing, vendor demonstrations, examination of past performance, and operational site testing. All these actions have taken place prior to contract award. Additionally, Government test activities for the COTS DVRS equipment that took place prior to contract award consisted of hands on Government technical evaluation team testing of selected Vendor's proposed DVRS equipment that was delivered and installed at the Stafford Building, FAA Academy, Oklahoma City, Oklahoma. The Government technical evaluation team evaluated and measured both operational capabilities and performance characteristics during Stage 2, Pre-evaluation/Qualification, of the streamlined acquisition process. The evaluation and testing during Stage 2 was similar to the classical Operational Test and Evaluation at the Technical Center. Additional evaluation and measurements were conducted by a Government evaluation team on a down-sized number of selected Vendor's proposed DVRS equipment that was relocated from the Stafford Building to FAA Air Traffic Control operational facilities during Stage 3, Final Evaluation, of the streamlined acquisition process, prior to contract award. The evaluation and testing during Stage 3 was similar to the classical Shakedown Testing at the first operation site. Also, contractor test activities for the COTS DVRS equipment take place after contract award and will consist of the successful Offeror's normal internal testing in accordance with their internal Quality Assurance Plan. This action has avoided unnecessary technical risks.

### **12.4.2 Risk Management**

The acquisition strategy for the FAA Acquisition Pilot Program, Digital Voice Recorder System (DVRS), commercial off-the-shelf (COTS) acquisition has used streamlined acquisition procedures, to include pre-contract award system(s) test and evaluation, cost benefit analysis, etc., in concert with Section 5063 of the Federal Streamlining Act of 1994 using alternative and innovative procurement procedures to mitigate risks associated with technical, schedule, and cost.

## **12.5 Configuration Management (CM)**

### **12.5.1 CM Responsibilities**

The Voice Switch and Recording Product Line (AND-320) has management responsibilities for the DVRS equipment through field installation, that include:

1. Maintaining the accuracy, completeness, and currency of all specifications, IRDs, and ICDs;
2. Ensuring performance of contract stipulated CM requirements in accordance with the contractor's CM plan;
3. Controlling the baseline;
4. Establishing and operating the FAA Acquisition Configuration Control Board (CCB).

The National Airway Systems Engineering Division (AOS-200) has CM responsibility for operational support phase activities, and will:

1. Plan and conduct Shakedown Testing;
2. Exercise configuration control of all project baseline documentation following the acceptance of this responsibility;
3. Serve as the custodian of the Instruction books and Maintenance Handbooks;
4. Maintain the configuration of the project support facility.

The FAA Logistics Center Engineering and Production Division (AML-400) has CM responsibilities for the baseline of the line repairable units (LRU) and will establish an AML CCB to maintain the configuration of the LRUs.

The Engineering Specialties and Configuration Management Support Division (ASE-600) has CM responsibilities for FAA CM. Support to the project includes configuration, identification, audit activity, control, and maintenance of the various baselines. Specific support is to conduct a functional configuration audit/physical configuration audit (FCA/PCA), and product baseline planning.

### **12.5.2 Configuration Control Boards (CCB)**

Approval of changes to the product baseline will be the responsibility of the AND-320 CCB until transitioned to the Maintenance Engineering (ME) CCB before the last installation and checkout. Until transition to the ME CCB, proposed changes submitted by regions or AOS-200 will be submitted as case files or processed as national change proposals (NCP) to the AND-320 CCB. If approved, the AND-320 CCB will monitor the implementation of the approved change.

### **12.5.3 CM Milestones**

The following are the CM milestones which signify a particular CM transition event:

1. Establishment of Interim Product Baseline
2. Conduct of the Formal Qualification Review (FQR) to establish the final Product Baseline
3. Conduct of the FCA/PCA for the equipment
4. Transfer of configuration control to AOS-200
5. Transfer of configuration control to AML-400

#### 12.5.4 Configuration Items

The following documents form the product baseline for the DVRS equipment:

1. Air Traffic (AT) Quick Reference User Guide
2. Operations and Maintenance Manual

The hardware consists of -- configuration items as follows:

1. DVRS recorder with IRIG-B output
2. DVRS reproducer
3. GPS antenna/receiver
4. IRIG-E interface - FAA modified
5. IRIG-E interface - Standard
6. RS-232 interface
7. RS-422 interface
8. Distribution interface
9. Uninterruptable power supply
10. AC line conditioning

#### **12.6-12.19 (Reserved)**

#### **12.20 Status assessment**

Administration and Project Management open items concern mainly CM and will be closed in the next revision of the PIP.

## **13.0 IMPLEMENTATION (REQUIREMENTS)**

### **13.1 Implementation Support Organization**

#### **13.1.1 NAS Implementation Specialist**

The DVRS NAS Implementation Specialist - Kevin Trombley, (202) 646-2037, comes from the NAS Implementation and Integration Program Branch, ANS-200. The NAS Implementation Specialist is the focal point for the Program Implementation Plan (PIP) and for all implementation issues as a member of the matrix support team. The NAS Implementation Specialist is the co-lead for the project's Implementation Management Team (IMT). [Implementation Process Guidelines, 10/93]

#### **13.1.2 Implementation Management Team (IMT)**

The Implementation Management Team (IMT) will be appointed by the Integrated Product Team Lead prior to contract award, and will include as a core the associate program managers for NAS Implementation, Engineering, Logistics, AT Requirements, Regional APM for the first site, AF sector representative from the first site, and AT facility representative from the first site. The IMT coordinates PIP development and supports identification and incorporation of implementation related requirements for the DVRS . The IMT will also help validate implementation strategies proposed by the equipment vendor and will help facilitate compliance with implementation policy and processes. The IMT will support resolution of DVRS implementation issues. [Implementation Process Guidelines, 6/94, 2.2.2]

#### **13.1.3 Regional Associate Program Manager (RAPM)**

The DVRS point of contact in the regions is the Regional Associate Program Manager (RAPM). The RAPMs are working coordinators for the regions in matters pertaining to the DVRS implementation. The RAPM will interface with all concerned regional offices and will be the regional liaison to the program office for DVRS activities. The RAPM will:

- a.** Represent the regional Airway Facilities (AF) Division in DVRS issues.
- b.** Interface with headquarters, other regions, the FAA Technical Center, and the FAA Aeronautical Center to coordinate planning, installation, and testing issues.
- c.** Coordinate with regional divisions/facilities on DVRS activities.
- d.** Coordinate regional review of DVRS documentation.
- e.** Coordinate the distribution of DVRS funds within the region.

Please refer to Table 13-1 for a listing of the Regional RAPMs.

REGION	NAME/OFFICE	TELEPHONE
Southwest	Ana Gonzalez, ASW-421	(817) 222-4213
Great Lakes	Neil Angelotti, AGL-459	(708) 294-7584
Northwest Mount'n	John Fredenburg, ANM-400	(206) 227-2414
Eastern	Steven LoVerde, AEA-452	(718) 553-3469
Western Pacific	Gary Pettengill, AWP-422	(310) 725-3495
New England	Ken Laponis, AEA-422KL	(617) 238-7432
Central	Doug Edwards, ACE-425	(816) 426-2242
Southern	Theresa Simpson, ASO-400	(404) 305-6294
Alaskan	Larry Ihlen, AAL-421A	(907) 271-5832

**Table 13-1 Regional Associate Program Managers**

#### 13.1.4 Technical Officer Representatives (TOR)

For each DVRS installation a TOR needs to be appointed to witness and participate in the installation, integration, and verification activities at each DVRS site. The Technical Officer (T.O.), AND-320, will charter the designated TOR with a letter of responsibilities (see Appendix E) as the on-site representative of the T.O. The TOR should:

- a. Serve as the central point of contact for all matters pertaining to site installation activities.
- b. Identify and coordinate with personnel who will participate in site preparation and installation efforts.
- c. Provide the installation personnel with access to the site.
- d. Ensure that contractor installation procedures meet contract requirements.
- e. Inform the T.O. whenever technical and contractual difficulties are encountered.
- f. Inform the T.O. as to the status of site preparation, equipment deliveries.
- g. Identify location for DVRS installation, to include GPS antenna mounting, installation, power and grounding connection points, internal facility cable raceways, and buried or hidden utility conduits that would affect the installation effort.
- h. Assist in verification of proper performance of the DVRS during site testing.
- i. Provide as built drawings for DVRS installation.

DVRS TORs will be assigned by the region in accordance with the list of sites receiving DVRS systems provided by ATR-116, Air Traffic Plans and Requirements (see Appendix D, which refers to section 11.2, Deployment Schedule).

#### 13.1.5 Contract Support

Contractor organizations supporting project and site implementation will be determined after contract award. Local and regional contractor support for site preparation, if required, will be secured as needed by the regions. Funding for contractor labor for site preparation will come from the region (see paragraph 7.1, Summary of Funding Plan).



### 13.2 Site Implementation Process

Site implementation activities will focus on the identification of changes or new requirements in physical, functional, or performance capabilities, resulting from the installation of the DVRS.

The NAS Implementation Specialist will work with the IMT to identify issues critical to the implementation process as early in the acquisition cycle as possible. Due to the nature of the DVRS being a Pilot Program for the DOT and much of the pre-contract award activities being source sensitive, many of the system specifics and logistical data are not available until after contract award. Management of the eleven essential elements of information identified in chapters 3 through 13 of this plan will ensure that implementation issues are identified and resolved in a timely manner.

The following subparagraphs will be used to describe the implementation activities associated with each site implementation phase and will identify the transitory requirements needed to accomplish implementation activities. "Transitory" requirements are the differences (i.e., deltas) between the existing human and financial resources and physical attributes of the facilities and equipment and those proposed.

#### 13.2.1 Implementation Planning Phase

In this phase, the IMT will ensure that adequate resources will be available and that appropriate site preparation activities have been accomplished. This phase normally starts upon approval of the MNS and lasts through the remaining phases of site implementation.

##### 13.2.1.1 Implementation Activities

DVRS implementation planning activities will consist of NAS Implementation Specialist coordination with the IMT to identify site implementation requirements, and the development of the PIP, GSIP and individual SIPs to track the progress of fulfilling those requirements.

##### 13.2.1.2 Requirements

Headquarters and field implementation personnel will prepare plans for the implementation of the DVRS equipment. Authorization of F&E funds to support regional activities will be negotiated between each region and AND-320 Product Lead based on regional budgets needs. Regional and facility/sector managers should consider the following strategies for addressing human resource management impacts identified in paragraph 8.1.1:

1. Identify facility/sector personnel for participation in the DVRS implementation planning activities, identification of facility/sector procedural impacts, and development/revision of facility/sector procedures.
2. Provide timely and accurate information regarding DVRS technical and operational features, installation activities and schedule.

During the implementation of the DVRS at a particular site, those activities identified here may include/effect AF F&E, sector, site, or a combination of multiple organizations'. It is envisioned that

regions will maximize the effectiveness and efficiencies of the available resources by exercising a great degree of flexibility in their assignments of AF personnel.

1. Prior to DVRS installation and checkout (Pre-INCO), AF sector personnel will be asked to participate in filling out installation worksheets, identifying the location for the placement of the DVRS recorder, GPS antenna (mast mounted) for contractor installation, and identifying the voice circuit demarcation terminals.
2. During DVRS installation and checkout (INCO), AF personnel will be required to be on-site during installation to:
  - a.) provide FAA POC (TOR) and monitor contractor installation activities
  - b.) participate in the contractor conducted DVRS maintenance and operations training
  - c.) participate in contractor acceptance inspection (CAI), and joint acceptance inspection (JAI).
3. During DVRS shakedown and dual operation activities, AF sector personnel will be involved in operating and maintaining both the DVRS equipment and the voice recording equipment being replaced by the DVRS.

### **13.2.2 Pre-Installation and Checkout (Pre-INCO) Phase**

#### **13.2.2.1 Implementation Activities**

The Pre-INCO portion of site implementation is the period of time prior to delivery of DVRS equipment to a facility. During this period, the major site implementation effort is preparing the installation worksheets, identifying the location for the DVRS installation, clearing adequate floor space for the installation of the DVRS, identify/install the AC branch circuit(s) and run power cable(s) (3 conductor, 15 amp minimum, 120 VAC circuit) from existing essential bus power to the DVRS equipment rack(s) location. The junction box for the connection of the DVRS to the AC service will be provided by the contractor and installed within the recorder equipment cabinet.

If the site desires the DVRS Recorder to be connected over an Ethernet LAN the LAN cables installation/routing and their termination are the responsibility of the Government. It is advised that this activity be completed prior to the installation of the DVRS. The contract does not provide for the contractor to initiate or complete these efforts.

#### **13.2.2.2 Requirements**

Prior to DVRS installation and checkout (Pre-INCO), AF sector personnel will be asked to participate in filling out installation worksheets, identifying the location for the contractor installation, clearing the floor space, ensuring all HAZMAT affecting the installation has been cleaned up, identifying the AC branch circuit, and identifying the voice circuit demarcation terminals.

### 13.2.3 Installation and Checkout (INCO) Phase

#### 13.2.3.1 Implementation Activities

The Installation and Checkout (INCO) portion of site implementation begins with delivery of DVRS equipment to a facility and ends with the successful completion of the CAI of the contractor installed DVRS equipment.

#### 13.2.3.2 Requirements

The TOR will coordinate all contractor installation and checkout activities with local and regional airway facilities personnel.

The contractor is responsible for DVRS equipment delivery, installation, checkout, and training including the following:

1. Provision of all equipment and materials necessary for installing the DVRS equipment.
2. Making all interface connections between the DVRS equipment and the AC branch circuit at the recorder equipment rack, and circuit connections at the voice circuit demarcation block(s) installed within the DVRS equipment rack(s).
3. Routing GPS cabling from the antenna to the rack mounted receiver.
4. Ensuring compliance with all contract requirements prior to final acceptance by the Government.
5. Providing on-site operational and maintenance training to a class of up to six (6) personnel.

The duration of the INCO portion is site dependent, but can be expected to require approximately one to two weeks, based on system size, from time of equipment delivery to completion of contractor training. The nominal delivery, installation, and training period is one week, for larger facilities such as ARTCCs a second week may be required.

### 13.2.4 System Integration Phase

#### 13.2.4.1 Implementation Activities

The integration portion of the DVRS site implementation starts before the CAI and is completed at the successful completion of the CAI after the contractor has demonstrated and tested the DVRS equipment.

The expected sequence for CAI and JAI is to conduct both of these activities in serial, after the AF & AT training are completed on the installed DVRS. This sequence will allow for the system configuration to be re-established to the baseline configuration.

Per FAA Order 6020.2A, Joint Acceptance Inspections for FAA Facilities, there shall be an Operational Readiness Demonstration to examine or inspect the following operational, maintenance and engineering areas:

- (1) Final refinement of operating procedures, methods, adaptation, and parameters.

- (2) Demonstration of adequacy of all aspects that involve actual control of air traffic prior to commissioning.
- (3) Verification that system, subsystem and equipment documentation accurately describes the facility at the time it becomes operational.
- (4) Verification that sufficient staffing exists and that personnel are sufficiently trained and familiar with system functions and equipment.
- (5) Verification that the required facility logistic support capability has been established and that technical logistic data and support material needed for operational use of the facility have been furnished in accordance with Orders 1800.30, Development of Logistic Support for FAA Facilities and Equipment; 6200.4A, Test Equipment Management Handbook; 4630.2, Standard Allowance of Supplies and Work Equipment for National Airspace System Facilities, and 4620.3B, initial Support for New or Modified Equipment Installations.
- (6) Verification of real property records in accordance with Section 2 and 3, Chapter 9, Order 4660.1, Real Property Handbook.

[Source: FAA Order 6020.2A]

#### 13.2.4.2 Requirements

1. Making interface connections between the DVRS equipment and the AC power circuit. The FAA will provide a 120VAC power service to the designated DVRS recorder equipment rack(s) location. The contractor will connect the DVRS power system(s) to the provided service at the junction box provided with the system; the junction box will be located within the recorder equipment rack. The DVRS reproducer, if provided, will require 120 VAC power from a standard grounded wall or floor receptacle. The TOR will be available to coordinate any integration concerns or issues that may arise.
2. Making interface connections between the DVRS equipment and the voice circuit demarcation terminals in the equipment room. The DVRS contractor will install and interface a 66 block, within the DVRS equipment rack(s), to the DRUs/recording channels.

The Government will cross connect the voice channels from the voice switch demarcation to the contractor installed 66 block within the DVRS equipment rack(s). This process will be slightly modified at the ARTCCs; where the VSCS frames are installed and cabled to HCVRs. The cabling interfacing the HCVR(s) to the VSCS will be reused to connect the DVRS with a change in the number of wires used, i.e., presently twenty (20) of the twenty-five (25) pair are planned for use with the HCVR, in supporting DVRS with these cables twenty-four (24) of the twenty-five (25) will be utilized. This will require regional engineering support, a detailed engineering plan will be made available to the regions after the Minneapolis installation. The present interface between the VSCS and the IDF/VDF will be unaffected by the DVRS installation.

3. Ensuring compliance with all contract requirements prior to final acceptance by the Government. As part of the CAI, this will be accomplished by both the DVRS contractor and the Government representative, i.e. TOR.

#### 13.2.5 Field Shakedown Phase

##### 13.2.5.1 Implementation Activities

The implementation activities at the site during the period of time between initial operating capability and operational readiness demonstration for the COTS DVRS equipment consists of a shakedown activity during the CAI, a joint DVRS contractor and Government activity.

##### 13.2.5.2 Requirements

1. Shakedown testing, post the initial DVRS site, will be completed by the DVRS contractor and the FAA personnel who will have maintenance responsibilities for the DVRS equipment.
2. The DVRS contractor on-site operational and maintenance training will take place during this phase. The duration and type of the training is identified in paragraph 11.3 and subject to revision in accordance with the contract.

#### 13.2.6 Dual Operations Phase

##### 13.2.6.1 Implementation Activities

The dual operations activities at the site take place during the period of time between JAI for the DVRS equipment and removal of the replaced voice recording equipment. During this time, both AF and AT personnel, as appropriate, will have become familiar with the new DVRS equipment.

##### 13.2.6.2 Requirements

1. The government will need to ensure cabling from the existing government demarc blocks to the DVRS equipment rack(s)/66 Block has been completed to integrate the voice switch to the DVRS.
2. During this period, AF sector personnel will have responsibility for operation, monitoring and maintaining both the new DVRS equipment and the replaced voice recorders. (This period of time should be used to develop confidence in the DVRS operations and supportability under live air traffic conditions.)

#### 13.2.7 Equipment Removal Phase

##### 13.2.7.1 Implementation Activities

The analog multi-channel voice recorders and spares replaced by the DVRS will be removed and disposed of in accordance with FAA Order 4800.2C and AAF-1 Memorandum, "Disposition Decisions for Replaced Equipments", dated October 1, 1992. ALM-700 has distributed a draft edition of the analog recorder disposal plan for comments, a formal distribution of the final disposal plan is expected in a June 1996. [Source: DVRS ILSP].

#### 13.2.7.2 Requirements

1. No AT impacts.
2. Physical facility is restored and area is returned for other use. The DVRS contractor will remove all contractor property such as tools, test equipment, and unused installation material, as well as relocating DVRS trash and other DVRS residue to the appropriate location at the specific facility for trash pick-up.
3. Relocation/removal of excess Government equipment is the responsibility of the region in accordance with Government orders regarding the management of government property. At the majority of the facilities, there will be a single rack of replaced voice recorder equipment that should be disconnected from the AC branch circuit breaker in the equipment room and the voice circuit demarcation terminals in the equipment room.

#### **13.3-13.19 (Reserved)**

#### **13.20 Status Assessment**

The DVRS contractor is responsible for a “turnkey” type installation and is required to commence installation and training on a schedule that has been coordinated with the regions and facilities.

Implementation risks concern the delay of installation due to site preparedness, and contractors ability to meeting deployments. These risk will diminish as the first sites are successfully installed.

## **Appendix A Generic Site Implementation Plan (GSIP)**





## **Appendix B Transition Information Exchange (TIE) Summary Report**

## Appendix B      TRANSITION INFO. EXCHANGE (TIE) SUMMARY REPORT

Specific implementation issues have been addressed in a closed forum due to the procurement sensitive issues associated to pre-contract award discussions. The DVRS shakedown at the Bay TRACON, CA. identified that all functional requirements were met, and those operational impacts identified were considered to be resolvable before fielding of the DVRS into the NAS. As DVRS implementation activities continue, any issues germane to the process will be recorded for inclusion into revisions of this document.

## **Appendix C Acronyms**

**ACRONYMS**

<b>ACF</b>	Area Control Facility
<b>ACE</b>	Central Region
<b>AEA</b>	Eastern Region
<b>AF</b>	Airway Facilities
<b>AGL</b>	Great Lakes Region
<b>ANE</b>	New England Region
<b>ANM</b>	Northwest Mountain
<b>ANS</b>	NAS Transition and Implementation Service
<b>ASF</b>	Area Support Facility
<b>ASO</b>	Southern Region
<b>ASW</b>	Southwest Region
<b>AT</b>	Air Traffic
<b>ATC</b>	Air Traffic Control
<b>ATQA</b>	Air Traffic Quality Assurance
<b>ATR</b>	Air Traffic Plans and Requirements Service
<b>AWP</b>	Western-Pacific Region
<b>CAI</b>	Contractor Acceptance Inspection
<b>CCB</b>	Configuration Control Board
<b>CDRL</b>	Contract Data Item Requirements List
<b>CIP</b>	Capital Investment Plan
<b>CM</b>	Configuration Management Plan
<b>COTR</b>	Contracting Office Technical Representative
<b>COTS</b>	Commercial-Off-The Shelf
<b>DAT</b>	Digital Audio Tape
<b>DOD</b>	Department of Defense
<b>DRR</b>	Deployment Readiness Review
<b>DRU</b>	Digital Recording Unit
<b>DVRS</b>	Digital Voice Recording System
<b>FAATC</b>	Federal Aviation Administration Technical Center
<b>F &amp; E</b>	Facilities and Equipment
<b>FCA</b>	Functional Configuration Audit
<b>FQR</b>	Formal Qualification Review
<b>FSR</b>	Final System Review
<b>GFE</b>	Government Furnished Equipment
<b>GSIP</b>	Generic Site Implementation Plan
<b>HAZMAT</b>	Hazardous Material
<b>HCVR</b>	High Capacity Voice Recorder
<b>HVAC</b>	Heating Ventilation and Air Conditioning

<b>ICD</b>	Interface Control Document
<b>IRD</b>	Interface Requirements Document
<b>ILSP</b>	Integrated Logistics Support Plan
<b>IMT</b>	Implementation Management Team
<b>INCO</b>	Installation and Check-Out
<b>JAI</b>	Joint Acceptance Inspection
<b>LGC</b>	LSA Guidance Conference
<b>LSA</b>	Logistics Support Analysis
<b>MCVR</b>	Multi Channel Voice Recorder
<b>MDFM</b>	Material Delivery Forecasting Module
<b>NDI</b>	Non Developmental Item
<b>NAILS</b>	NAS Integrated Logistics Support
<b>NAILSMT</b>	NAILS Management Team
<b>NAS</b>	National Airspace System
<b>O&amp;M</b>	Operations & Maintenance
<b>ORD</b>	Operational Readiness Demonstration/Date/Deployment
<b>ORD</b>	Operations Requirements Document
<b>OT&amp;E</b>	Operational Teat and Evaluation
<b>PCA</b>	Physical Configuration Audit
<b>Per-INCO</b>	Per-Installation and Check-Out
<b>PIP</b>	Program Implementation Plan
<b>PM</b>	Program Manager
<b>PMT</b>	Project Management Team
<b>PSR</b>	Preliminary System Review
<b>PTR</b>	Program Trouble Reports
<b>RAPM</b>	Regional Associate Program Manager
<b>RFP</b>	Request For Proposal
<b>SIP</b>	Site Implementation Plan
<b>SOW</b>	Statement of Work
<b>SM</b>	Sector Maintenance
<b>SRMMS</b>	Sustain Remote Maintenance Monitoring System
<b>TBD</b>	To Be Determined
<b>TBR</b>	To Be Revised
<b>TBS</b>	To Be Supplied
<b>TEMP</b>	Test and Evaluation Master Plan
<b>TIE</b>	Transition Information Exchange
<b>TIM</b>	Technical Interchange Meetings
<b>T.O.</b>	Technical Officer
<b>TOR</b>	Technical Officer Representative



## **Appendix D Site Deployment Schedule**

Appendix D (refer to section 11.2, Deployment Schedule) contains the proposed site deployment schedule. Delivery dates will be coordinated between System Plans and Programs Division, Air Traffic Plans and Requirements Service, ATR-116 and regional personnel. The Material Delivery Forecast Module (MDFM), and the "AND320 Projects" on the CC:MAIL Bulletin Board will provide the most current data available on system deliveries.



	<b>Install &amp; Train</b>	<b>City OPS date</b>	<b>Facility</b>	<b>Site Ident</b>	<b>Re g</b>	<b>L</b>	<b>PCN</b>	<b>RCD Size</b>	<b>REP Qty</b>	<b>GPS</b>
1	9/6/95	Oakland (Bay)	TRACON	O90	WP	V	QMRU	48	1	1
2	11/27/95	Aeronautical Center	Engr'g	AOS-220			S53S	64	1	0
3	11/27/95	FOB-10A Headquarters	ATH-10	ATH-10				0	1	0
4	12/11/95	Oakland (Bay) <b>1/29/96</b>	TRACON	O90	WP	V		48	1	1
5	1/22/96	Los Angeles <b>3/30/96</b>	ATCT	LAX	WP	V	7C4A	48	1	1
6	1/29/96	O'Hare (Chicago) <b>10/96</b>	ATCT	ORD	GL	V	QXDN	48	2	0
7	1/29/96	Tallahassee <b>6/26/96</b>	TRACON/ ATCT	TLH	SO	III		16	0	1
8	2/5/96	Elgin (Chicago) <b>10/96</b>	TRACON	C93	GL	V	Q7NG	128	3	0
9	2/12/96	Richmond <b>5/24/96</b>	TRACON/ ATCT	RIC	EA	III	5BHP	32	0	1
10	2/12/96	Cape (Falmouth /Otis) <b>2/28/96</b>	TRACON/ ATCT	K90/ FMH	NE	III		32	0	1
11	2/12/96	Minneapolis <b>10/96</b>	ARTCC	ZMP	GL			240	1	0
12	2/26/96	San Juan	CERAP/ AFSS	ZSU	SO	IV		48	1	1
13	2/26/96	Atlanta <b>3/12/96</b>	TRACON/ ATCT	ATL	SO	V		48	1	1
14	2/26/96	Phoenix <b>4/8/96</b>	TRACON	P50	WP	V		48	1	1
15	3/4/96	Minneapolis <b>3/14/96</b>	TRACON/ ATCT	MSP	GL	V		64	1	1

16	3/4/96 - 3/11/96	Fort Belvoir <b>3/15/96</b>	Davison AAF					16	1	1
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17	3/11/96	Allentown <b>3/21/96</b>	TRACON/ ATCT	ABE	EA	III		32	0	1
18	3/18/96	Salt Lake City <b>4/10/96</b>	TRACON/ ATCT	SLC	NM	IV	BKUK	64	1	1
19	3/18/96	Miami	TRACON/ ATCT	MIA	SO	V		64	1	1
20	3/18/96- 3/25/96	Fort Belvoir <b>3/27/96</b>	Pentagon Heliport					16	1	1
21	3/25/96	Miami	ARTCC	ZMA	SO			240	1	0
23	4/1/96	Tampa	TRACON/ ATCT	TPA	SO	V		48	1	1
24	4/1/96	Reno	TRACON/ ATCT	RNO	WP	III		16	1	1
25	4/1/96	Sacramento	TRACON	MCC	WP	V		48	1	1
26	4/1/96- 4/8/96	Fort Lewis	Gray AAF					48	1	1
27	4/8/96	Anchorage	TRACON/ ATCT	ANC	AL	IV		32	1	1
28	4/8/96	Las Vegas	TRACON/ ATCT	L30/ LAS	WP	V		32	1	1
29	4/8/96	Detroit Metro	TRACON/ ATCT	DTW	GL	V		64	1	1
30	4/15/96	Charlotte	TRACON/ ATCT	CLT	SO	V		32	1	1
31	4/15/96	Pittsburgh	TRACON/ ATCT	PIT	EA	V		48	1	1
32	4/15/96- 4/22/96	Los Alamitos	Los Alamitos AAF					16	1	1

33	4/22/96	Pensacola	TRACON/ ATCT	PNS	SO	V		32	1	1
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34	4/22/96	Monterey	TRACON/ ATCT	MRY	WP	III		16	0	1
35	4/29/96	Guam (Agana)	CERAP	ZUA	WP	III		16	1	1
36	4/29/96	Montgomery	TRACON/ ATCT	MGM	SO		3F69	16	1	1
37	4/29/96	Los Angeles	ARTCC	ZLA	WP			288	1	0
38	5/6/96	Nashville	TRACON/ ATCT	BNA	SO	IV		32	1	1
<b>39</b>	5/6/96	Coleman AAF	USAEUR					16	1	1
<b>40</b>	5/6/96	Hill AFB								
41	5/13/96	Raleigh	TRACON/ ATCT	RDU	SO	IV		32	1	1
42	5/13/96	Tucson	TRACON	U90 (DMA)	WP	IV		16	1	1
<b>43</b>	5/13/96	Heidelberg AAF	USAEUR					16	1	1
44	5/20/96	Memphis	TRACON/ ATCT	MEM	SO	IV		32	1	1
45	5/20/96	San Diego	ATCT	SAD	WP		OAQP	32	1	0
<b>46</b>	5/20/96	Heidelberg AFOD	USAEUR					48	1	1
47	5/27/96	Providence	TRACON/ ATCT	PVD	NE	IV		32	1	1
48	5/27/96	Wichita	TRACON/ ATCT	ICT	CE	III		32	1	1
49	5/27/96	Portland	TRACON/ ATCT	P80/ PDX	NM	IV			1	1
50	6/3/96	Cincinnati	TRACON/ ATCT	CVG	SO	IV		32	1	1

51	6/3/96	Washington National	TRACON/ ATCT	DCA	EA	V	9T2K	48		
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<b>52</b>	6/3/96	Wiesbaden AB	USAEUR					16	1	1
53	6/10/96	USS J. F. Kennedy	USN							
54	6/10/96	Honolulu	TRACON/ ATCT	HNL	WP	IV		32	1	1
<b>55</b>	6/10/96	Hanau AAF	USAEUR					16	1	1
56	6/17/96	West Palm Beach	TRACON/ ATCT	PBI	SO	IV		32	1	0
57	6/17/96	Honolulu	CERAP	ZHN	WP			48		
<b>58</b>	6/17/96	Giebelstadt AAF	USAEUR					16	1	1
59	6/24/96	Jacksonville	TRACON/ ATCT	JAX	SO	IV		48	1	1
60	6/24/96	Portland	TRACON/ ATCT	PWM	NE	III		16	0	1
<b>61</b>	6/24/96	Illesheim AAF	USAEUR					16	0	1
62	7/1/96	Manchester	TRACON/ ATCT	MHT	NE	III		16	1	1
63	7/1/96	Omaha-Offut	TRACON	R90	CE	III		16	1	1
<b>64</b>	7/1/96	Ancbach AAF	USAEUR					16	1	1
65	7/8/96	Greensboro	TRACON/ ATCT	GSO	SO	IV		16	1	1
66	7/8/96	Des Moines	TRACON/ ATCT	DSM	CE	III		16	1	1
<b>67</b>	7/8/96	Grafenwoer AAF	USAEUR					16	1	1
68	7/15/96	High Desert (Edwards)	TRACON	E10	WP	IV		32	1	1

69	7/15/96	Tri City	TRACON/ ATCT	TRI	SO	III		16	0	1
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70	7/15/96	Hohenfels AAF	USAEUR					16	1	1
71	7/22/96	Burlington	TRACON/ ATCT	BTV	NE	III		16	0	1
72	7/22/96	Spokane	TRACON/ ATCT	GEG	NM	III		32	1	1
74	7/29/96	Boise	TRACON/ ATCT	BOI	NM	III		16	1	1
77	8/5/96	Fresno	TRACON/ ATCT	FAT	WP	IV		16	1	1
78	8/5/96	Colorado Springs	TRACON/ ATCT	COS	NM	III		16	1	1
80	8/12/96	Louisville	TRACON/ ATCT	SDF	SO	III		32	0	1
81	8/12/96	St. Louis	TRACON/ ATCT	STL	CE	V		48	1	1
83	8/19/96	Ft. Myers	TRACON/ ATCT	RSW	SO	III		16	0	1
92	#REF!	Fayetteville	ATCT RADAR cab	FAY	SO	III		16	0	1
95	#REF!	Rochester	TRACON/ ATCT	ROC	EA	III		32	0	1
96	#REF!	Birmingham	TRACON/ ATCT	BHM	SO	III		32	1	1
97	#REF!	Kansas City Int'l	TRACON/ ATCT	MCI	CE	IV	6KK1	48	1	1
98	#REF!	Knoxville	TRACON/ ATCT	TYS	SO	III		16	0	1
#REF!	#REF!	Charleston	TRACON/ ATCT	CHS	SO	III		16	0	1

#REF!	#REF!	Houston Intercontinental	TRACON/ ATCT	IAH	SW	V		48	1	1
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#REF!	#REF!	Dulles International	TRACON/ ATCT	IAD	EA	V		32	1	1

Notes: NEW = New project

M1720 = sites with model 1720 Magnasync recorders

D5000 = sites with model 5000 Dictaphone recorders

VSCS = new project funded by VSCS

3M = sites with 152 channel 3M recorder

S = this column identifies sites receiving spares kits



## **Appendix E Attachments**